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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CLX. No. 3106.] LONDON, NOVEMBER 22, 1922. [74th Year. Price 1s.

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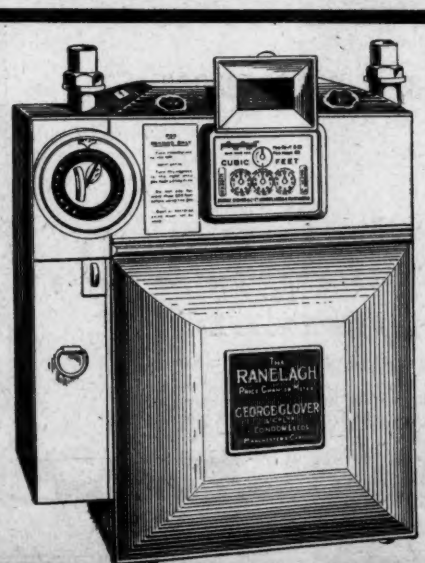

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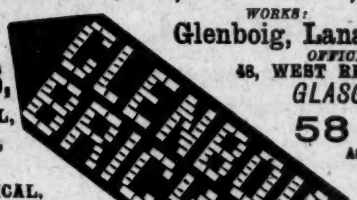

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EDITORIAL NOTES.

The New Parliament and Industry.

THE flood of political oratory has subsided with the General Election; and the new Government, under the premiership of Mr. Bonar Law, has been authorized by the country to carry-on the affairs of the State. A majority has been secured of sufficient dimensions to ensure that responsible government will be allowed to work its way, and give the country a period of peace from speculative legislation and wild social and financial schemes. We are glad of this—not from any party point of view, for the "JOURNAL" is perfectly neutral in respect of party—but because we sincerely believe that what the country now wants more than anything else is a period of rest within which to allow industry and commerce to make necessary re-adjustments to new conditions, and to devote themselves to working for the re-establishment and expansion of prosperity. That is the way to the relief of the heavy burden of national finance, and to the best solution of the ugly problem of unemployment.

Whatever may be individual political tenets, there is one thing on which most men in the industrial and financial world are agreed, and this is that in the Prime Minister we have a man whose experience and training in a great industry will be invaluable in his powerful position; and his past record shows that he has a very keen perception of the trend of business and finance in the country and in the Empire generally. There are to-day large problems affecting the nation which require delicate and circumspect handling; but at the root of the solution of those problems are the stabilizing and progress of our industries and trade. For accomplishment, confidence is requisite; and confidence was not to be secured by experimental enactment nor by the depredations that the Labour Party were planning to make on the great essential of industry and trade—capital. Therefore, better a strong Government pledged to give industry and trade a chance of showing what it can do in helping to rehabilitate the fortunes of the country, than a Parliament disintegrated into relatively small parts, and about whose legislative work there would be always a disconcerting uncertainty. That is how men of many shades of political belief are viewing the results of the General Election. This has placed the Labour Party numerically in the chief position in the House on the opposition side, which side of the House will, by the fragmentary character of the other sections, well exemplify the folly of cleavages between men in political life whose ideals, beliefs, and aspirations are closely allied. But these very conditions, with the strength of the Government considerably more than counterbalancing the opposition, have already implanted new confidence in the country. The knowledge that the threat of a capital levy has been, by the opinion of the electors as expressed by the results of the election, hurled out of the arena of practical politics, and is not to be feared so long as the present Government is in power, has already shown good effect among the investing public, which means that the menace had a disturbing effect, and that confidence fortunately has been restored. It was on this particular hobby-horse that so many of the Labour members have got into Parliament, combined, of course, with the vote-splitting triangular fights. The capital levy was an attractive bait for many workers, the great mass of whom know very little concerning financial and industrial economics. "Make the capitalists pay" was a vote-winning cry; and capital was held up to contempt as being the root of all evil. The fact that it is the root of industry and of employment, which are the antitheses of evil, was not heralded from the labour platforms. However, the result of the General Election shows the country where it is, and gives promise of a period of peace in which to make an effort to forge ahead. That is what is wanted.

We are sorry to see that Sir W. H. Cowan has not retained his seat, and that Sir J. Fortescue Flannery, Bart., is no longer in the House—not having on this occasion presented himself for re-election. The gas industry has thus lost two friends in its representation in Parliament. On the other hand, there are replacements in the re-election of Mr. Reginald Clarry at Newport (Mon.), and in the election at Oxford of Mr. F. Gray, the Secretary of the Oxford Gas Company. Col. H. K. Stephenson, the Chairman of the Sheffield Gas Company, has also been re-elected. We heartily congratulate these gentlemen; and particularly Mr. Clarry on his notable success in facing two contests within a few weeks of each other. In October, he beat his Labour opponent in a triangular fight by a majority of 2090. On this occasion, in a straight fight with the same Labour candidate, Mr. Clarry added nearly 1000 to his majority (3019).

The Suggested Therm Inquiry.

SOME people have highly flexible imaginations, which lead them into all sorts of singular positions, and into making strange suggestions and reflections. Not long ago, the London County Council asked for an inquiry into the therm question. There would never have been any "question" if certain pragmatic individuals and newspapers had not dressed-up the therm in all kinds of queer nonsense. If the therm is the fairest possible basis of charge, then it is the right basis. There can be no gainsaying that, and therefore there can be no "question" regarding it. It does not appear that the London County Council have any ground for complaint, so far as their own gas accounts are concerned. But they have, in asking for an inquiry, given way to the senseless clamour of a few malcontents, and to those who incite and try to keep agitation alive. Though the much-abused therm is in operation as the basis of charge throughout London to-day, the London County Council and the consumers know full well that gas accounts are making appreciable descent because the price per therm has been reduced. We have in this fact affirmation that the therm as a basis of charge is not hostile to the consumers' interests; but, on the contrary, apart from the protection that it gives them, it operates as actively as the 1000 c.ft. basis of charge. But though there is much evidence abroad as to the stupidity and shallowness of the recent newspaper agitation, there are some men who will not see in the facts that there are no grounds left for urging that an inquiry should be held.

The matter was raised again at last week's meeting of the County Council. The Chairman of the Public Control Committee was asked by Mr. W. C. Johnson whether any reply had been received from the Board of Trade to the Council's request for the institution of an immediate inquiry into the method of charging by the therm. There was no harm in that question; but there was a nasty innuendo in an addendum. It was as to whether the Chairman had any reason to believe that certain gas interests were bringing pressure on new Ministers to prevent the holding of an inquiry. The Chairman of the Committee (Mr. Sanger) replied that no answer had been received up to that day from the Board of Trade, and that a further communication on the matter had been addressed to the Board. He also stated

that he had no knowledge as to whether the gas companies were taking steps to prevent an inquiry being held. Now we wonder who put the notion as to covert operations into the head of Mr. Johnson. Perhaps he does not know, and so we may repeat, that the gas industry, through its chief organization, has already said that, if an inquiry is considered desirable by the Government authorities, it will be prepared to take part in it, notwithstanding that it would mean a sheer waste of time and money. The London County Council, from their own experience, must know that requests for this or that are often based upon ignorance; and in such circumstances it would be folly to yield to them. If Government Departments or the County Council did that sort of thing, there would be no limit to the demands that would be made upon them. The Board of Trade must be allowed to investigate a petition for an inquiry to ascertain whether there is any ground to justify it, or whether it would mean putting much machinery into operation to ascertain something that is already known—thus wasting money and time. They could not make that investigation, and come to a determination amid the political turmoil of recent weeks. Moreover, the Board are in this matter advised by the disinterested experts of the Board of Fuel Research; and that Board were the authors of the therm system, and as such knew quite well what they were recommending. As opposed to this expert advice, we have the call for an inquiry from those who have betrayed a vast amount of ignorance in the matter. They want an investigation into the action of the therm in raising the sum of a number of gas accounts—a number relatively small compared with the whole—while the erratic thing refused to increase others, and now is operating in generally reducing consumers' accounts. The whole matter, with facts so obvious, is too absurd for inquiry. Yet Mr. Sanger is reported to have said that, if an early and favourable answer was not received from the Board, his Committee would continue to press for an inquiry with all the means at their command! An inquiry into what?

The Time to Reconstruct and Extend.

IT is not usual to notice in the editorial columns of the "JOURNAL" announcements that are made in the advertisement columns. But there is an exceptional appeal to gas undertakings in the advertisement pages to-day; and it particularly arrests our attention. It is made by the Woodall-Duckham Company—not with the view to inducing gas undertakings to adopt continuous vertical retorts, but in the interests of the gas industry and of trade generally. Sir Arthur Duckham, in his public life and in his association with the Society of British Gas Industries, has given prominence to the opinion that our position as citizens demands from us that we should not shut-out from view anything that comes within the province of the individual that can be performed or carried out for the common weal. The same applies in collective capacity—as in industries. It is to-day very extensively believed that we have now a stable Government, that industry and trade are going to have as fair a chance to recuperate as is possible; in short, there is a quiet optimism abroad that things are shaping for betterment. Now and then times come that are particularly opportune for serving one's own interests and simultaneously for helping the country. Such a time, it is the firm impression of Sir Arthur Duckham, and on very good grounds, is here to-day. The position of many gas undertakings in industrial areas, owing to trade depression, is not as their administrators would like it. Those concerns depend very considerably upon industry and trade for their maximum dealings in both primary and secondary products. The appeal that is made to the administrators of gas undertakings is based on the ground that now they can serve their own interests, and at the same time help to improve the trade of the country. The facts of the situation confirm this. There is no doubt a great deal of inefficient gas plant in existence; and there can be no question that, when industry gets back to its old levels, and the demands for gas increase, many undertakings will wish that, when opportunity afforded, they had made provision, by reconstruction and extension, for what seems, from a careful survey of the position, inevitable. Prices for work have not been at so low a level as they are to-day for several years; and competition for business is very keen. But steel prices are showing a tendency to rise; so that this is the time to get on with work, either for the improvement or the extension of plant, whatever its nature. The "appeal" concludes with the assurance that, "by placing orders for "gas plant and apparatus to-day, gas undertakings will im-"mediately benefit themselves, and help the trade of the "country," which also means assisting in the relief of unemployment. Another point is that, when work is slack, contractors can give better attention and quicker delivery than when trade is brisk. It is hoped the appeal will induce widespread consideration, followed by the desired action.

The Coke Market and Capital Expenditure on Gas-Producing Plant.

IN an article contributed to this issue under the above heading, Mr. G. M. Gill has several philosophic things to say, which should have the effect of turning the minds of many managers to a consideration of the question whether or not they are getting from their retort-houses, no matter the type of plant with which they are equipped, the maximum results possible. Also whether, in the retort-house circumstances of some works, the decision to adopt water-gas plant is always completely justified. Mr. Gill is not an opponent of water gas. He was brought up in works where water gas is utilized regularly and fairly extensively; but he has a distinct leaning towards the retort-house, whose capacity for good and profitable work often, it must be admitted, falls short of the maximum through an insufficiently broad and critical examination, and positive observance, of details. In exploring this question of retort-house working, Mr. Gill asks himself the question, Why is it that such a number of gas engineers in small and medium sized works have introduced water-gas plants? He finds that in the past few years they have had quite substantial reasons; but whether in all cases those reasons have the same weight to-day seems to be a question that he has settled in his own mind in the negative. He says the tendency is to use the retort-house to a smaller extent, and to make more water gas. If this is so, then Mr. Gill's article is to all intents and purposes a challenge to the general tendency of practice. He gives reasons for his attitude. Investigation has led him to the conclusion that the grounds upon which water-gas plants have been adopted in many cases are that more gas has been sold, new producing plant of some description was needed, and the consensus of opinion is against supplying a comparatively rich coal gas, and few managers have any liking for the trouble of selling more coke than is imperative. But we miss from the article all mention of the utility of such plants in meeting heavy casual demands or emergency requirements, and helping to negotiate peak loads. One must not forget there are tendencies in gas use that contribute to the shaping of tendency in gas practice, and those tendencies in gas use will mean heavier and heavier variations in demand. We have particularly in mind domestic heating in winter; and to the flights in consumption for this purpose, a water-gas plant can quickly respond. However, our contributor does not find that the extension of water-gas plants has been made with the idea that the therm is thereby cheapened.

Mr. Gill does not definitely dispute the validity of the causes he has noted for the tendency of practice, excepting perhaps in a qualified sense the one referring to the lessening of the sale of coke. Discussing those causes, the author admits that during the war and post-war periods of low dividends, capital was difficult to get; and it was then important, owing to that condition and in view of the heavy costs of materials and labour, to obtain plant at as low a cost as possible per unit of production. That is where water-gas plants come in. Capital, of course, plays a very important part in the over-all costs of manufacture; but, at the same time, now that capital is more available and cheaper, this cause for adoption has admittedly reduced weight. In considering the question of capital, too, one has to take into account the relative capital involved outside the carbonizing plant *per se* and the water-gas plant—such as the coal and coke handling plant for the former. However, that leaves us practically with two causes (omitting any credit for collateral advantages) for adopting water-gas plant to-day. The one is the utilization of water-gas to reduce the calorific value of the coal gas, and the other the market for coke. As to the former, of course there would be little sense in utilizing water gas for dilution purposes if, per resulting therm, there was no reduction in the manufacturing cost compared with the supply of straight coal gas. That has to be demonstrated in each case; and even then such a valu-

able auxiliary, which gives elasticity to manufacturing capacity, and therefore comfort to the management, would not in most cases be lightly discarded. The question of reducing the quantity of coke for sale comes in through the difficulty in some areas of selling it at satisfactory prices. This is a matter upon which Mr. Gill holds some strong views. He is convinced, from his personal experiences, that few managements have taken the pains to advertise and demonstrate the good points of coke. This is a matter upon which he speaks with authority, having (as may be remembered from the series of articles published some time since in our columns, and which are about to be republished in booklet form) made a special and extensive study of the development of coke sales. But that was in a fairly good industrial area, and not all districts are equally favoured. The coke-absorptive powers of gas-supply areas must and do vary considerably. At the same time, it is abundantly certain that the utilization of coke, particularly for steam-raising, is not what it should be, and that it is so is, in our opinion, due largely to the lack of technical cultivation in its proper use. It is obvious Mr. Gill is of opinion that condition might be remedied.

This brings us to the main point in our contributor's article, which is that capital expenditure should not be incurred in the provision of new plant of any kind until it has been thoroughly ascertained that the capacity of the existing plant for more efficient and so more lucrative results has been exhausted. Given a reasonably good coke market, it is submitted that it is probably true that coal-gas plant (the author does not distinguish between the various types) will usually produce a therm cheaper than it can be in any other kind of producing plant. Therefore, it is advisable not to discard the use of existing coal-gas plant until the possibility of improving the coke market has been thoroughly explored; and there is no shortage of evidence that in many undertakings the whole question of the remunerative disposal of coke needs thorough investigation. If a development of the local coke market can be made, so that the first of the secondary products is rendered more remunerative, and the coal-gas plant can be tuned-up to a state of higher efficiency, and more use be made of its capacity, then the capital represented by the existing carbonizing plant would be more profitably employed, and the necessity for the expenditure of additional capital in manufacturing plant might be avoided, or at any rate deferred. Another argument is that, in the case of small and medium sized works, to make part of the gas in the coal-gas plant and part in water-gas plant, means that the size of the gas-making unit is reduced in each case, which reduction makes it more expensive to manufacture a given quantity of gas. From all points of consideration, there is ground for accepting Mr. Gill's plea that the full possibilities of the coke market and of the existing plant should be explored before incurring additional capital expenditure. That is only sane procedure. Naturally, if manufacturing plant is not working to its maximum possible efficiency, the cost of the therm is correspondingly higher. If on top of this there is unnecessary capital expenditure, then the financial position of the concern must be depreciated, unless the new plant produces economies which counterbalance the deficiencies in efficiency of the old plant, and more than meets the capital charges on the new. That is an important point, for it cannot be gainsaid that there is in existence a large amount of inefficient plant which it would be a real economy to displace by modern construction. The article will be widely read; but possibly all gas engineers will not be prepared to accept every point made in it.

Economies in the Distribution Department.

THE accounts of gas undertakings during the past twenty years have shown an enormous increase under the head of distribution. This is excellent evidence of the considerable amount of work that is being done in connection with the extended business, which has been brought about largely by the growth of the applications of gas. But with the expenditure in the distribution department mounting up in this way, the more pressing has become the necessity for efficient control of men engaged and outlay incurred upon the work. The necessity, however, has not in many cases resolved itself into performance; and in those cases the old crude methods still obtain which give more encouragement to looseness than to systematic control. This was the case until not very long since at Stafford; and Mr. T. H. Poulson, the Engineer and Manager, has made no secret of the fact by reading a paper on "The Reorganization of the Stafford Distribution Department," before the Midland Association of Gas Managers. But he also proves the wisdom of what has been done by showing very material results. As a matter of fact, until there is thorough investigation, in detail, of what is being done in the Distribution Department, one is totally ignorant of how much loss there may be in that particular direction; and, of course, all loss is in some way injurious to the business. The work of reorganization was carried out in collaboration with the Commercial Organization Section of the "B.C.G.A."; and the scheme which Mr. Poulson describes was introduced. He does not claim that it is perfect; but it is effective. It places the management in possession of data (including costs) as to every job, and every man's work day by day; and these data are always at hand. Unproductive time has been lessened, fitters' productivity has been increased, and fixing charges have been lowered considerably. This reduction of fixing costs is an advantage not only to the undertaking, but to the makers of gas appliances, as installation expenses must be a factor in popularity and adoption. The cost in clerical labour has also been diminished by the introduction of systematic control. We will not go into details; to do so would mean traversing the whole paper, which is published in this issue. But there is one short, pregnant paragraph, which admirably sums-up the effect of the reorganization, and which will have a persuasive influence on the managements of other undertakings who have not yet applied similar methods to the work of the distribution department. The paragraph reads: "Considerably more work "is being accomplished by a staff of thirty men than was "done hitherto by forty-two men. The financial effect of "the reorganization, after taking into account the automatic "wage reductions, shows a saving on labour cost of £1380 "for the year ended March last." This attests that such a system was required at Stafford. Interesting as the whole paper is, this one paragraph will drive straight home.

Sulphate of Ammonia Policy.

No one can have read the report of the British Sulphate of Ammonia Federation for the financial year ended on May 31 last, as already published in the "JOURNAL" [p. 447], without coming to the conclusion that, in a year of critical conditions, those in charge of operations (under the chairmanship of Mr. D. Milne Watson) pursued a sagacious course in policy—and a course which could not have been safely determined by any individual undertaking. Policy of the kind requires a very broad survey of factors that are not confined to this country, but have world-wide place. The collection alone of the data to enable this to be done can only be accomplished by a highly efficient organization in communication with all the sources of reliable information; and then it requires expert discrimination properly to assess the data, and to arrive at prompt decision. It may be, as was the case at the beginning of last year, that the conditions necessitate a drastic cut in price, in order to strengthen the future position. The world's nitrogen availability was at that time such that, to have done otherwise than put the price at a figure that would liquidate stocks, would have been highly disastrous. As it was, the bold course taken was not helpful to the nitrate of soda people; but it had the effect of reinforcing the position of sulphate of ammonia to a degree that has enabled the price to ascend to a somewhat higher level. There came the long coal strike, which had the effect of reducing make through the non-operation of coke-oven plants, and inducing greater manufacture of water gas for town supply. A shortage of sulphate came; and the farmers who had been holding-off from buying, extensively began to want it. The nitrate people saw their opportunity; and strenuous were the efforts made to persuade the farmers to buy nitrate instead of sulphate; but they had comparatively little success. Here again the Federation had to exercise prudence in the matter of price, and in operating to give as wide satisfaction as they could in the matter of delivery. They refused to raise the price for neutral quality to a point that would have brought it to a level with nitrate prices; and the reason attributed for this is that the price was high enough in view of the financial difficulties of the farmers. Not only that, but taking that course at such a time, with the heavy pressure from nitrate, was a diplomatic act, and was in a sense legislating for the future. Sulphate, through the propaganda work of the Federation and the improvement in the quality, has grown in the estimation of the farmers. But the fluctuating conditions, which had to be

dealt with promptly and decisively, resulted in the average price for the year being about 40 p.ct. lower than for 1920-21. But it is quite easy to see that, had a different line of action been taken, it might well have been that a total collapse would have taken place.

It is satisfactory that, so far as the position can be visualized, the prospects for the coming season are encouraging. One good feature is that the stocks of nitrate have been reduced, stocks of sulphate are non-existent, and Germany is not an immediate competitor for export. It is therefore a reasonable hope that there will be a considerable advance of the average price for the current year. That in Great Britain and Ireland there is an extensive field for developing the market for sulphate is shown by Table I. in the report. It will be observed that the actual consumption of pure nitrogen per acre of arable land only averages 4·53 lbs., while in Germany it is 10·3 lbs. The possible consumption of nitrogen is 12 lbs., or 7·47 lbs. more than the existing consumption. The remark as to Germany not being an immediate competitor for export cannot be applied to any continued period running far into the future; because Germany and other countries have to be taken into account as potential factors for the future in respect of the output of nitrogen products by synthetic processes. That is a very good reason why operations should at present be on lines that will firmly attach home consumers and buyers abroad to British production. The Federation in their report make no secret of the possibilities as to the future. The synthetic plants, it appears, can only be worked profitably on the large scale; and therefore it is quite feasible to anticipate that in time production will on occasion outstrip demands. Thus Germany may again become an exporter—and on a large scale; but at the present time home consumption absorbs all its output. It is therefore necessary to take into our calculations the possibility of synthetic nitrogen before long bringing down the price of sulphate to a lower level. There cannot be any positive prediction; but everything points to this being the case. That is one of the strongest reasons for the existence of the Federation. There must be a central body watching events all over the world, with the power to act as information and knowledge dictate..

Another point is that the relation of price to cost of production has been of a character to induce—in fact, to compel—several of the smaller works to discontinue the manufacture of sulphate. We do not blame the managements of those works; at the same time it is a pity that the force of circumstances has rendered this necessary. But the position has undoubtedly been considerably eased by the fall in wages, fuel, and raw material. For instance, during part of this year, sulphuric acid has been obtainable in some districts at £3 per ton. This is a substantial drop from what it ascended to during the war. Nevertheless, it is still some 100 p.ct. over pre-war price. The report says plainly that the current figure will have to be greatly reduced if sulphate of ammonia makers are to adjust their costs of production to the level of selling prices of nitrogen which may be expected in the not distant future. The makers of sulphuric acid would perhaps do well to take into account the influences that are menacing the value of the sulphate of ammonia produced by the carbonizing industries, and do their further part to help to moderate costs, and so to meet competition from abroad.

In addition to this, the report strongly emphasizes the fact that commercial organization cannot be a permanent substitute for technical efficiency in methods of production. The outlook is such that the maximum of efficiency is necessary—both in respect of yield per ton of coal, and in the details of the items of manufacture. The "maximum efficiency" brings in its train a reduction of costs. In this direction, consideration should be given to the problems of increasing the yield of ammonia per ton of coal carbonized. There should be good control of, and economy in, the use of steam in sulphate plants. This should be a fruitful line for inquiry. The consumption of lime should be watched; and loss of ammonia through waste liquor should be carefully guarded against. It is interesting to find that there has been a marked increase in the output of neutral quality. This is as things should be. It is a senseless proceeding to try to resist the inevitable. At the time the report was prepared, over 50 p.ct. of the output was of neutral quality. Two points should be particularly noted—one is that the demands of users of sulphate are becoming more exacting, and the other is that everything possible should be done to strengthen its competitive position.

The Windsor Basic Price.

It will be remembered that, when the Windsor Gas Company's Bill was before the Unopposed Bills Committee of the House of Commons last May, they refused to fix the basic price per therm, considering that the matter was one for adjudication by the Board of Trade. The Board, in compliance with the reference, have now issued an Order, placing the basic price within the borough of New Windsor at 13·5d. per therm, and beyond those limits at 14·5d. per therm. These figures are below the first ideas of the promoters. In the Bill as originally introduced, they asked for 16d. within the borough, and 19d. beyond. From this it will be seen that, though there is some talk of holding an investigation into the basic price principle, the Parliamentary authorities are not objecting to the basic price system being incorporated in Bills; but the clause will probably have to be drafted in the form passed by the Unopposed Bills Committee in the case of Windsor, so as to make provision for the determination by the Board of Trade of the basic price.

Expenses of Members of Junior Associations.

Our "Correspondence" column last week showed that the information given at the recent meeting of the Yorkshire Junior Association as to the payment of the expenses of members attending the meetings was not comprehensive enough, and did not do justice to all the undertakings that are assisting in this very beneficial work among their technical assistants. However, the Hon. Secretary (Mr. F. A. C. Pykett) has set the matter right this week, by publishing in our "Correspondence" columns a list of the Corporations, Companies, and District Councils who render, in the case of the Yorkshire Junior Association, encouragement and help in the form mentioned. We hope that many other administrations of gas undertakings in the country will emulate their generosity in this matter. It is well deserved. Can the Hon. Secretaries of the other junior organizations say whether the practice extends to any of their members?

Pulverized Coal for Gas Enrichment.

While discussion is proceeding as to the use of low-temperature gas for enriching town gas in place of oil, it is interesting to note in our "Register of Patents" this week an invention from America, whereby it is proposed to enrich water gas by the use of finely powdered coal. The process is simply this: During the period of the blow, the upper part of the water-gas generator is raised to a suitable pre-determined distilling and fixing temperature. Then during the steaming period the finely pulverized coal is brought into suspension in the upper part of the generator above the fuel bed. For introducing the powdered coal, the carrying medium is preferably a gas (water gas, for example); and the coal is suspended in the generator in the form of a cloud, which meets the up-rising water gas. The suspended particles are immediately distilled, releasing their content of volatile hydrocarbons under the influence of the heat of the up-rising water gas, and the heat radiated from the incandescent brickwork. The particles of coke settle down on to the fuel bed. But there must be a relatively low steam admission while the powdered coal is being admitted into the generator, or otherwise the particles will find entrance to the exit-flues, with what results can be imagined without description. It is stated that by this means a water gas of high thermal and illuminating power can be made, and the value may be controlled within reasonable limits by varying the amount and richness of the pulverized bituminous coal employed. No data are given to show the relation of the quantity of pulverized coal to the enrichment work accomplished.

Increasing Vertical Retort Capacity.

Another novelty in connection with continuous vertical retort working is included in the patent specifications this week. West, Madden, and Boardman are the names identified with the invention. Its object is to increase the output of gas from, and the throughput of coal in, the retorts without increasing the heat applied to the exterior—the additional heat required being obtained by the simultaneous or alternate introduction to the coke at the base of a continuous vertical retort of steam and air in regulated quantities. The admission of air to the coke chamber is said to provide an efficient method of securing the high temperature necessary for the production of water gas from the in-

jected steam. This addition to the process, it is stated, results in increased gas yields, a diminution of scurf on the retorts, an enhanced yield of ammonia, and greater throughput of coal with economy in fuel consumption.

Gas Coal Position.

On the whole, the anticipations of collieries as to the demand for gas coals are being fulfilled. In gas-supply residential districts, the demand for gas has had the seasonal acceleration, which has been further helped by the recent fogs and low temperatures. In certain industrial areas, there is perceptible progress in trade revival, with the result that the demand for gas in manufacturing establishments is moving upwards. This accounts for the reports from various coal areas that the call for gas coal is good, and that output is being well absorbed. The information is general that there is little supply on the open market. In Durham and Northumberland it is stated that there is now a little easing of the situation in regard to gas coals. Perhaps for the sake of Durham it is just as well this should be known, as some gas undertakings, owing to the information as to heavy bookings forward for abroad and elsewhere, have been drifting with orders to other fields, where their requirements have been more easily satisfied.

Enlarged Coal Output.

The "Board of Trade Journal" has been reviewing the conditions prevailing in the coal-mining industry during the September quarter. As is well known, the scarcity of coal in North America and Germany has had a very salutary effect upon demand at a time when our home industrial requirements were low. The output of saleable coal in the quarter was 62·33 million tons, which figure has not been equalled in the corresponding quarter since 1916. Regarding employment, there were, it is estimated, 1,113,000 persons employed in and about the mines, including clerks and salaried persons—a greater number than at any period since work was resumed at the mines in July, 1921, and only 4000 fewer than were employed before the war. The consumption of coal at home, however, continued at a low level; and in spite of the extra demand for coal from abroad, and the seasonal increase in the price of house coal, the average level of prices at the mine was slightly lower than in the quarter ended June last. Wages, on the whole, have tended downwards since June; and instances have occurred in which the proceeds were not sufficient to meet standard wages and profits—thus causing the carrying-over of deficiencies under the terms of the national agreement. These deficiencies have, however, been wiped out; and indications are not wanting that the improved working conditions at the mines during the quarter will raise wages in two or three districts above the minimum, and in others enable the owners at least to secure their standard profits. The quantity of coal available for consumption in the United Kingdom during the September quarter was 37,750,000 tons (allowance being made for the coal equivalent of coke and manufactured fuel exported), or 500,000 tons more than during the previous quarter. In the corresponding quarter of 1913, there were 42,500,000 tons of coal similarly available; but employment in industry in this period was much more regular. No allowance is made in either period for the difference in the stocks of coal held at the beginning and at the end of the quarter.

PERSONAL.

In last week's General Election, which resulted in a substantial working majority for the Conservative Party, we were pleased to see that Mr. REGINALD G. CLARRY succeeded in holding by a large majority the seat which he won a month ago in the Conservative interest at Newport (Mon.). Mr. FRANK GRAY (the Secretary of the Oxford Gas Light and Coke Company), as a Liberal, won a notable victory at Oxford; and Mr. A. HAYDAY (Vice-President of the National Union of Workers) was re-elected a Labour Member for West Nottingham. For the Park Division of Sheffield, Col. H. K. STEPHENSON, D.S.O., the Chairman of the Sheffield Gas Company, has again been elected, and will take his seat as a National Liberal. Mr. T. MAULE GUTHRIE, the Chairman of the Brechin Gas Company, Ltd., has been returned at Moray and Nairn, as a National Liberal, having defeated an Independent Liberal. Mr. Guthrie was returned unopposed at a by-election in June of this year. We regretted that Sir W. H. COWAN, contesting as a National Liberal the Eastern Division of Aberdeen and Kincardine, lost his seat to an Independent Liberal. Sir J. FORTESCUE FLANNERY, Bart., the Deputy Chairman of the South Suburban Gas Company, did not again contest the Maldon Division of Essex, which he had represented since 1910.

Mr. JAS. S. BATHGATE, of the Edinburgh Gas Corporation Department, has been appointed to a responsible position with the Oriental Gas Company in Calcutta, and leaves this country on Dec. 1. Mr. Bathgate has for some years been a prominent member of the Scottish Junior Gas Association (Eastern District), and was last year appointed a member of the Council.

At All Saints, Maidstone, on Nov. 1, Mr. ARTHUR WELLS, Gas Engineer and Manager to the Milton Regis Urban District Council, was married to Miss Nina F. Pickett. A number of useful presents included a pair of silver vases and a silver sugar bowl and sifter from the employees.

To the satisfaction of those who, in recent years, have watched locally the many notable developments which have taken place in connection with the Nottingham Corporation gas undertaking, Alderman A. BALL was, at a meeting following the late November elections, again elected Chairman of the Committee. For their revenue-earning capacity, the Nottingham works have established something of a record among municipally-owned concerns, and this result has been largely due to the keen interest which Mr. Ball has manifested in his duties.

Dr. FRANCIS WILLIAM ASTON, Research Fellow of Trinity College, Cambridge, who has been awarded the 1922 Nobel Prize for Chemistry, is a Birmingham man, and was Assistant Lecturer in Physics in the Birmingham University in 1909. He is a D.Sc. of Birmingham University, and M.A. of Cambridge.

OBITUARY.

The death occurred on the 19th inst., after a long illness, of Mr FREDERICK EDWARD LINGING, of No. 4, Kensington Court Gardens. Deceased, who was in his 76th year, will be remembered by many old friends as at one time Engineer and Manager of the Norwich Station of the British Gas Light Company, Ltd., a position which he held for about twenty-two years. He resigned on account of impaired health in October, 1897, and received from the then Chairman of the Company (Mr. J. Horsley Palmer) a letter expressing the regret of the Directors in accepting the resignation. A pension was granted him. Previous to going to Norwich, Mr. Linging had had a varied and extensive experience. After completing his articles with Mr. Horatio Brothers, the Engineer of the Equitable Gas Company, he entered their service. Subsequently he became Assistant Engineer, and eventually Engineer and Manager, of the City of Moscow Gas Company. Later on he joined the Imperial Continental Gas Association; and, after visiting all their stations on the Continent, he took up his abode in Vienna, where, before he left, he had the supervision of the second largest station in the city. It was from Vienna that Mr. Linging went to Norwich. He became a member of the Gas Institute in 1878, and remained on the roll until he resigned from the service of the British Gas Light Company. He was also an associate member of the Institution of Civil Engineers.

ELECTRICITY SUPPLY MEMORANDA.

THE third of the electric salesmen's conferences in London is stated to have been a success. The term "success" seems to cover such a vast number of measurements of this particular quality that one does not know quite what was in the mind of the writer in employing the description. However, the paper was on "Large Fires and Cookers," and the author was Mr. F. H. Howell, who is associated with the exploitation of "Hotpoint" and "Falco" specialities. To our mind, the paper, to salesmen on the look-out for solid fact, must have been very disappointing; for the ingredients of the communication were largely platitudes and generalities. The "Electrical Review" says the paper was "probably" from the salesman point of view the best of the series so far. That is a matter of opinion; but we do not think there will be any disagreement with the view of our contemporary that the discussion was "somewhat disappointing." The speakers did not appear to be able to keep off the domestic side of the business. This is quite natural, as it is that side with which salesmen are for the most part acquainted—the dealing in large heating equipment being more a matter for the specialist. Mr. Howell says there is a big field for electric cooking. Of course, there is a big field for anything that can show a higher over-all economy and efficiency than anything that is already in existence. But naturally, the bigger the equipment, the greater the cost of displacing already connected apparatus; and if this is giving satisfaction, the more difficult is it to get proprietors of hotels, restaurants, &c., to scrap the old, and adopt something new. The question for them to consider is as to whether the additional economy (if any), no matter the heating medium used, is going to compensate them for the new outlay which they are invited to incur. Mr. Howell had something to say on the question of how to get into this new field. At present

Large Electric Cookers.

there does not appear to have been much electrical success in this direction, seeing that the author had to tell his audience that the number of renewal gas and coal ovens and fires that go into big hotels every day is astonishing. This is true, as our gas apparatus manufacturers can testify; but the fact is proof that those most concerned—the proprietors of the hotels—are not convinced that electrical operation is the superior thing. The hotels or restaurants where the electrical salesmen dine are recommended as a good starting-point for their operations. Perhaps after a few months' experience on the part of the management, the electrical salesman would find excellent cause for changing his dining place. Personality, of course, is marked as a great thing; and this requires to be backed by reputation for sound knowledge and good workmanship.

The Competitor and Some Admissions.

Mr. Howell asks a very pertinent question: "Cannot we cooking salesmen, with our efficient apparatus of to-day, absolutely (to use a vulgar expression) 'put the lid on' the gas-stove?" There is no reason to suggest they could not, if the electrical equipment could show superior paying advantages. But it cannot; and so we are afraid the lid would have an uncomfortable seating. However, he looks upon the electric cooking and heating industry as a young child who is showing signs of being a healthy youth; but "we cannot afford to run any risks with those in charge of it." This is a confession that very tender handling is necessary; and it is a confession that is subscribed to by many electrical men. All the attributed virtues will not carry electric cooking far without that tender nursing. That is proved; and it is questionable whether the tender nursing will do all that is expected of it. Mr. Howell tells the electrical salesmen that "Get on, or get out" might be taken as a rule for them. If it were taken as a rule and acted upon, it might be very unfair to the salesman; for the salesman, however hard he works, cannot make people do what they have no inclination to do. If initial costs and working expenses are high, if there is not the same economy of money and time, the same range of application, and the same degree of reliability as with other agents, then the salesman has something almost impregnable against which to work. That is not his fault, so that if he cannot get on through no fault of his own, he ought not to be thrown out of his job; but the facts of his hopeless position should be recognized, and an easier task be allocated to him. Gas methods were described as old-fashioned. If that is so, and it was our lot to be a salesman, then we would sooner work for the old-fashioned methods than for the new electrical method, if it can be called "new" after forty years of manufacturing and commercial endeavour to establish it. It is also said that electricity at 1d. or 1½d. per unit can compete with any other system of cooking. If the term cooking is intended to comprise the 80 p.ct. or so of the total work of a gas-cooker that is carried out on the hotplate, then that 1d. or 1½d. is wide of the mark. When statements are made of this kind, they should apply to equivalents. But it is such looseness as this that is found in the general assertions in the paper that passes muster for good material in electrical writings. We would put one question here: Assuming there is equality in efficiency for the various purposes to which the hotplate is put, which is the cheaper system—that which supplies the larger number of heat units for a penny, or that which supplies the smaller number? We agree that, in the case of an electric-cooker, as in that of a gas-cooker, the purchaser acquires something more than the mere article. Mr. Howell says that he also buys comfort, cleanliness, and the abolition of dirty work. We have known users of electric-cookers that have had occasion to doubt the comfort, when elements have begun to depreciate, and there is progressively slower operation, and when in the midst of cooking something has gone wrong. But comfort, cleanliness, and abolition of dirty work are qualities of the gas-cooker; and prompt response to duty, and a large range of application, are superior qualities as compared with the electric-cooker. What is more, the public are beginning to learn that this is so through the experiences of those who have been tempted to try the latter. At first, the new possession and the novelty may give satisfaction and a certain amount of pleasure; but it is the constant, enduring satisfaction that matters.

Design of Electrical Cooking Appliances.

In "Electrical Industries" Mr. R. Gillespie Williams has been discussing the design of electric cooking and heating appliances. He points out that there is a section of the electrical trade that is still doubtful as to the economy and reliability of electric cooking apparatus; but he thinks that those who share this opinion are in the minority. We think that if Mr. Williams looks farther afield than the electrical industry, he will find among the public a majority who are doubters. Like many other electrical men, Mr. Williams is dogmatic. According to him, it has been conclusively proved that, with electricity at a reasonable figure, electric cooking is now unrivalled. At the same time, we are glad to find sagacity. Although in his opinion electric cooking is most efficacious and desirable, this, he admits, does not imply that "electrical cooking appliances, or indeed any other cooking apparatus, are perfect." There are degrees of imperfection; and there are degrees in the liability to go wrong. He agrees that there is room for improvement. He refers to the open-type boiling-ring, with polished reflector; and the difficulty of keeping the reflector polished, with the result that the efficiency falls-off. Then with the type of apparatus on the hotplate, some method of heat control is desirable. With a grill, for example, the heat necessary to cook sausages is not the same as that to make toast quickly. At least a low and a high heat are required, and not a fixed heat, especially when the grill is adaptable as a boiling-ring, for the heat required to boil water quickly is far too fierce for ordinary grilling purposes. Discussing the relative merits of open type and covered-in type of boiling-rings, Mr. Williams says that, once the enclosed type is hot, there is little to choose between the two, although the construction and shape of the utensil used has an important bearing upon efficiency. It is very necessary to have close contact between the utensil and the enclosed type of element; but how can this condition be maintained, in the way vessels are usually handled in the kitchen? The needs of electricity will not alter human habits and methods. Special utensils will obviously have to be supplied with the cooking apparatus, and with sufficiently strong bottoms to withstand indentation. A glass observation window in the door of the oven, and a lamp to illuminate the interior of the oven, are recommended. It is also pointed out that there is no avoiding the fact that for efficient results the current consumption must be high enough for the work. Apparently increased complication or more expensive construction is needed, to make a more perfect electric cooker. This all costs money.

Electric Heating.

Turning to electric heating, Mr. Williams asserts a well-known fact—it is seriously handicapped by the present cost of power current, and, "for continual heating of a room, can hardly be described as economical." For occasional use—say, for half an hour in a bedroom—an electric-fire is said to compare favourably with a coal fire, if the cost of lighting the latter is taken into account. He looks to the day when the contract system of charging for current will be universally adopted. In his opinion, many more electrical appliances would be purchased, were it not for the excessive cost of using these off the lighting circuit with current at 7d. and 8d. per unit. However, with all the drawbacks and disadvantages, Mr. Williams believes that electric heating is destined to a splendid future. There is nothing like optimism; but we are afraid there will not be realization while the production of electrical heating energy is such an inefficient process.

Fairness in Comparison.

If an electrical man tries to be fair in making comparisons with gas, there are some narrow electrical minds that cannot understand what he is about. He is supposed to be fouling his own nest, or doing something else that he should not do. Last week we called attention to the point made in Mr. R. Smith's paper, at the second electrical salesmen conference, regarding the approximate equality in cost of a 2 KW. electric fire supplied with current at 1d. per unit and a 30 c.ft. (15,000 B.Th.U.) gas-fire supplied at 1s. per therm. We showed the unfairness of this in respect both of prices and the heat transmitted to the room. Prof. G. W. O. Howe, in the "Electrician," calls attention to the two fires not being comparable. Looking at the facts on the data given, Prof. Howe points out: "The gas-fire takes 30 c.ft. at 500 B.Th.U.—*i.e.*, 15,000 B.Th.U. per hour, which at 1s. per therm, or 100,000 B.Th.U., would cost 1·88d. The electric fire at 1d. per unit would cost 2d. per hour; so that the cost, as stated, is roughly the same in the two cases. But what are we getting for our money? In the case of the gas-fire, 15,000 B.Th.U.; and in the case of the electric fire 2 Board of Trade units. To compare these, they can be converted into any common units. If we take the foot-pound, 1 B.Th.U. = 778 ft.-lbs., and therefore 15,000 B.Th.U. = 11,670,000 ft.-lbs.; 1 Board of Trade unit = 2,650,000 ft.-lbs., and therefore 2 units = 5,300,000 ft.-lbs. Hence the gas-fire develops more than twice the amount of heat; and even if 50 p.ct. went up the chimney, it would still give more heat to the room. More than 50 p.ct. may go up the chimney. If so, let us have the facts." That is honest. The "Electrician" says, in a comment, that Mr. Smith did not draw any close comparisons between gas and electricity; but the fires he referred to were taken "as standard types of apparatus for warming moderate sized rooms, and that at the rates current in many districts, the cost of using them was about the same." That is very thin. No one reading the statements in Mr. Smith's paper would have done anything else than infer that he was drawing comparisons between things equal in all respects. What is the good of comparisons in price without the factor of duty rendered? It seems to us that the "Electrician" is trying to make out that Mr. Smith was more foolish than we formerly thought in making such a contrast.

An All-Electrical Borough.

Poplar is ambitious. The Borough Council have obtained an unenviable notoriety by showing how to make a deplorable mess of local finances. They have an electricity undertaking; and they are hoping to make the borough an all-electrical one. An electrical exhibition is now running; and at the opening Mr. Edgar Lansbury presided. This name seems familiar in connection with certain political and social movements. He stated, among other things, that the Council are endeavouring to bring within reach of all the convenience and cleanliness of electricity. He claimed that not only is electricity the best and cleanest kind of power for home or factory, but the

Council are proving that it is the cheapest in the long run. It will be a long run before that can be proved. He also grotesquely asserted (according to a newspaper report) that the price of gas to-day is 140 to 160 p.ct. higher than before the war. Mr. Lansbury must be an extraordinarily bad arithmetician if he has made the calculation himself. At a price equivalent to 6d. per therm before the war and 10d. per therm now, this is a 66 p.ct. increase; while he confesses that Poplar electricity is 50 p.ct. higher than before the war. The object of the Council, he also mentioned, is to lay mains in every street in the borough, so that every ratepayer, no matter how poor his circumstances, may have the opportunity of using electricity for lighting, heating, and cooking. If people in poor circumstances used electricity for lighting, heating, and cooking, they would find themselves in Queer Street before long. In all probability, too, the Council will discover that, in not a few streets, they have sunk capital that is unprofitable. It is also announced that it is intended to convert all the existing gas-lamps to electric lighting, with a minimum of 150 c.p., and a maximum of 1000 c.p.—the latter for main thoroughfares. The labour members of the Poplar Borough Council have a strange way of looking after the working-class people. But we rather think these will decline with thanks the application of electricity in their homes for lighting, heating, and cooking; unless, of course, the labour-ridden Council decide to let them have current free of cost! Who knows?

THE IMPORTANCE OF THE RETORT-HOUSE.

By G. M. GILL.

During the past few years there has been an increasing tendency to use retort-houses to a smaller extent and to make more water gas, plant for which has been installed in countless works. Many managers who previously relied upon coal gas only are now making a mixed gas. There are several reasons given to account for this development. First, many gas undertakings have been selling more gas, and required new plant of some description. Secondly, there appears to be a consensus of opinion against supplying a comparatively rich straight coal gas. Thirdly, few managers have any particular liking for selling more coke than they are obliged to do. The extension of water gas would not appear to be based upon the opinion that the production of the therm is thereby cheapened.

SCARCITY OF CAPITAL.

To take the causes of this development in the order named. Normal increase in sales is naturally to be expected, and such necessary extension of plant requires the expenditure of money, which has been in many cases very difficult to procure. This is probably due, to a large extent, to the poor dividends paid during and since the war, so bringing gas stocks and shares into disrepute with the investing public. The difficulty of dealing in the stocks and shares of the smaller gas companies has always been a great disadvantage whenever new capital was required; and this difficulty has become accentuated, for the reason mentioned above. Consequently, gas companies having to extend their works have been very ready to buy plant upon which the capital outlay was relatively low in relation to the amount of gas made. This probably explains one of the principal reasons why extensions of water gas and complete gasification plant have been so much to the fore.

LOWER-GRADE GAS IN FAVOUR.

The second reason named relates to the undoubted desire to make a gas of a lower calorific power than was being supplied prior to the war. Rightly or wrongly, there is a strong tendency among gas engineers and managers to hold the opinion that gas of 450 to 500 B.Th.U. quality is a better commodity than one of above the latter figure; while of those holding exceptional views, there are more in favour of a gas of 400 to 450 B.Th.U. than of a gas of 500 to 550 B.Th.U. quality. This opinion is based upon recent conversations which the writer has had with many engineers. He does not propose in this article to discuss the question of gas quality and the relative advantages of high and low grade gas; but in putting forward his impression of what would appear to be the views of the majority, he suggests that this constitutes one of the chief reasons for the considerable extension of other than straight coal-gas plant. The recent installations of continuous verticals are also designed to make a gas of 450 to 500 B.Th.U. quality; so that in these cases again there is the same tendency, carrying with it the use of less coal and more coke in order to make a given quantity of gas.

COKE SELLING DIFFICULTIES.

The third reason accounting for the extension of plant to make gas from coke instead of coal arises out of difficulties in selling coke at satisfactory prices. Coke has always been the "Cinderella" of the gas industry, and few have taken any particular pains to advertise and demonstrate its good points. Coke being bulky, a gas-works yard soon becomes congested if it is not selling well, and a sale of the inconvenient surplus usually results in a corresponding congestion of a neighbouring gas manager's yard. So the burden becomes shifted from back to back, to the ultimate disadvantage of every undertaking affected.

Given a reasonably good coke market, it is probably true that coal-gas plant usually produces a therm cheaper than it can be made in any other kind of gas-works plant. It is therefore advisable not to discard the use of existing coal-gas plant until the possibilities of improving the coke market have been thoroughly explored *de novo*. Every factor contributing to the prosperity or otherwise of a business needs review periodically; and there is no end of evidence to suggest that the whole question of coke and its remunerative disposal needs a thorough investigation in many undertakings.

IMPROVING OLD PLANT.

There is another matter which bears closely on the question of the best methods of providing more gas without incurring additional capital outlay. In some cases coal-gas plant capable of making the additional gas is already in existence, but is not used for the reason that the extra coke thus produced would have to be sold. In other instances the existing coal-gas plant could not, in its present state, and under the existing working conditions, make the additional gas required; but were the working methods reorganized, the same plant could be made to produce a largely increased quantity of gas without necessitating the expenditure of capital. It is suggested that in such cases there is a satisfactory solution to the problem, which not only enables the extra quantity of gas to be made, but also provides it at a cheaper price—the inevitable result of improved output per unit of plant.

It is not long ago that increased output was a favourite topic of discussion in all technical publications; and there is little doubt that the large amount of thought which was given to this subject by engineers and other technical men achieved many notable successes. It will not be disputed that there are many gas-works where seed sown towards increasing output in the retort-house would indeed reap a rich harvest. The desire to have a new plant has in some cases been stronger than the desire to tune-up the old plant. This attitude is easily understood; but it is not business, at any rate when capital is scarce.

THE INCREASED EXPENDITURE OF WORKING TWO TYPES OF PLANT.

The present generation of engineers should never forget the old adage, "Dividends are made or lost in the retort-house;" for it is still as true as it ever was. The present-day readiness to close-down the retort-house and to transfer the work to the water-gas plant will not, in the writer's opinion, result in most instances in the lasting benefit of the undertakings adopting this policy. So many works of small and medium size are now making part of the gas in the retort-house and part in the water-gas plant, thus reducing the size of the gas-making unit in each case, and so making it more expensive to manufacture a given quantity of gas. Small plant operation is always relatively expensive, and it does not assist matters to make it still smaller. It may be suggested that, in working a retort-house and water-gas plant in one small works, it is possible to arrange for the same men to carry out the necessary work in both plants. A little consideration will show that this is only practicable to a limited extent; and if carried to excess, the results of both plants suffer.

THE POSSIBILITY OF IMPROVING RETORT-HOUSE WORKING.

The writer would suggest that the method of gas making which brought prosperity to so many undertakings in the past should not be too lightly discarded, and certainly not without first inquiring into the full possibilities of the existing plant. An old retort-house so often lends itself to modernization on simple lines, without incurring expensive reconstruction. The adoption of a better quality of refractory materials alone, as the existing retorts wear out, can often improve the output of a retort-house by at least 25 p.ct. Again, the efficient working of a retort-house depends to a large extent upon the experience of the management and the judgment used in settling the countless details involved in managing a retort-house. As is well known, the achievement of maximum efficiency of any carbonizing plant depends upon the way in which operation details are carried out. If details are neglected, efficiency drops very quickly; while a neglected detail has an indirect and cumulative effect in a deteriorating direction on the other details involved in retort-house management.

There is no gainsaying the fact that in many cases retort-house working is not being well conducted, and the cost of making gas is correspondingly high; but fortunately there is no part of the plant which lends itself so readily to comparatively rapid and substantial improvement. In this connection, the writer would suggest that if engineers would ascertain the proportion of the whole expenditure that is incurred within the four walls of the retort-house, they would be astounded at the relatively large amount of money involved in retort-house working—which emphasizes, in a way that nothing else can, the predominating importance of the retort-house and of the manner in which it is worked. If due consideration be given to this factor, and its bearing upon the production of cheap and good gas, there cannot but be an improvement in retort-house management, while the truth of the old statement that dividends are made and lost in the retort-house will again be demonstrated in works where it was in danger of being forgotten.

The next congress of the Royal Sanitary Institute will, by invitation of the Mayor and Town Council, be held at Hull, from July 30 to Aug. 4, 1923.

LOW-TEMPERATURE CARBONIZATION AND THE THERM.

By WALTER CHANEY.

THE writer of the above article is indebted to Mr. Evetts for his criticism in the "JOURNAL" of Nov. 15; and although, through pressure of time, he is unable to reply fully in this week's issue, he will, with the permission of the Editor, deal with the latter portion of Mr. Evetts' criticism at a later date.

The writer should preface his remarks by stating that neither the method of arriving at the cost of the therm nor the apparent double credit for the coal had been overlooked. The method of calculating the therm instanced as the correct one by Mr. Evetts was adopted by the writer in arriving at the coal and coke figures set out in the article in question, which fact perhaps Mr. Evetts will accept as confirmation of the preceding paragraph. Hitherto the writer had adhered to the apprised value of 4d. per therm mentioned in the report of the Fuel Research Board for gas of 1000 B.Th.U. per c.ft., and yielding 30 therms per ton. Why then, Mr. Evetts asks, should the price of 750 B.Th.U. gas yielding 50 to 60 therms be raised to 9d. or 10d. per therm when the value of such a gas should be less than the apprised value of 1000 B.Th.U. gas yielding only 30 therms?

The manufacturing costs of the gas undertakings "A," "B," and "C" were the actual figures for the year 1921, and not hypothetical data based upon anticipated results of the present moment. Low-temperature gas at that time could have been supplied to undertaking "A" at a cost of 6d. per therm, this low-temperature gas being a secondary product in the manufacture of smokeless fuel, &c.

The manufacturing cost of gas undertaking "A" for straight coal gas during the year 1921 was 8d. per therm, based upon a consumption of 12,571 tons of coal and a production of 880,000 therms per annum. In an endeavour to show the comparative saving of both coal and cost of production, had water gas and low-temperature gas been introduced at that time, the price of the low-temperature gas was advanced to 9d. per therm, retaining the original cost of the straight coal gas at 8d. However, accepting Mr. Evetts' principles and corrections in detail, and working out the costs on those lines, would result in the following:

Original Cost to Gas Undertaking "A," 8d. per Therm.

Water gas increased to 5·7d. per therm (Mr. Evetts' figure).

60 p.ct.	coal gas at 8d.	= 4·80d.
14 ,,	water gas at 5·7d.	= 0·80d.
26 ,,	low-temperature gas at 6d. . . .	= 1·56d.
	Cost of mixture	7·16d. per therm.
	Original cost . . .	8·00d. per therm.
	Cost of mixture . .	7·16d. ,,
	Saving . .	0·84d. ,,

880,000 therms at 0·84d. . . . . = £3080

Cost of Water Gas at 4d.

60 p.ct.	original cost of gas at 8d. per therm	= 4·80d.
14 ,,	cost of water gas at 4d. ,,	= 0·56d.
26 ,,	cost of low-temp.gas at 6d. ,,	= 1·56d.
	Cost of mixture . . .	= 6·92d. per therm.
	Original cost . . .	8·00d. per therm.
	Cost of mixture . .	6·92d. ,,
		1·08d. ,,

880,000 therms at 1·08d. . . . . = £3960

The saving shown by the writer in the article of Nov. 8, with water gas at 4d. per therm, was £3979. Mr. Evetts' views of what is a fair basis and reasonable figures for a works similar in size to gas undertaking "A" have no bearing upon the actual cost of production of the undertaking under review. If, however, it is the intention in the Revision of Cost Table to illustrate the economy of the mixture over the original cost of 8d., then the difference between 6·28d. and the original price is equivalent to £6306.

The writer would point out that water gas could not have been introduced into gas undertaking "A" without falling back upon Mr. Evetts' low or high temperature gas of 600 B.Th.U., which supply is credited at 70 therms, while the writer's suggestion of 60 therms of 750 B.Th.U. is questioned.

The writer fully appreciates that all costs have been reduced considerably since the returns for 1921 were published, and that such reductions influence or are common to either high or low temperature carboniza'ion.

Determination of Sulphur in Coal.—The following method is suggested in the "Gas Age Record" as having proved satisfactory for the determination of sulphur in coal: One gramme of the coal is intimately mixed in a porcelain crucible with two grammes of copper oxide and one gramme of anhydrous sodium carbonate. The crucible is placed on an asbestos ring, and heated with a bunsen burner. If stirred occasionally, the action is complete in about two hours. When cold, the crucible is transferred to a large beaker, and moistened with bromine water to oxidize any sulphites to sulphates. The residue is then treated with hydrochloric acid and bromine water, heated to effect solution, and finally to exclude bromine, filtered, and the sulphur estimated in the filtrate in the usual way.

COAL AND ITS UTILIZATION.*

THIS is a booklet containing five lectures delivered, in the Fuel Department of the Sheffield University, by masters of the subjects with which they respectively deal. Every student of coal and its utilization in carbonization processes should be in possession of this booklet, which, from our point of view, should have been considered worthy of something better than a paper cover; for it really constitutes a text-book in small compass. In the first lecture, Dr. Marie Carmichael Stopes treats of the constitution of coal from the Palæobotanical aspects; and this is a subject which she has made her own. The second lecture was by Mr. F. S. Sinnatt, M.Sc., F.I.C., Lecturer in Fuels at the University of Manchester, and Director of Research, Lancashire and Cheshire Coal Research Association. His subject was the "Preparation of Coal for the Market;" and this is a matter with which the longsuffering gas industry is very much concerned. In the third lecture, Dr. R. Lessing deals, under five heads, with the carbonization of coal—destructive distillation, carbonization in gas-works, carbonization in coke-ovens, low-temperature carbonization, and complete gasification. To attempt to cover so much ground in a single lecture, naturally produced shortcomings, which, Dr. Lessing says, are in themselves sufficient proof of the complexity and importance—technical and economic—of the problems treated. He adds: "If my dissertation has done nothing more than to display the amount of ignorance from which we are still suffering in regard to the very fundamentals of the materials and processes involved, and the necessity for a great deal of intense study of the constitution of coal and the conditions of its metamorphosis under heat, it has not been written in vain." The "Purification of Coal Gas" is the subject of the fourth lecture; and it was delivered by Mr. Horace Chamberlain. Finally, we have Prof. John W. Cobb treating of the subject of "Ammonia from Coal"—a matter into which he has been penetrating somewhat deeply. This lecture deals with the nitrogen in coal, and its recovery as ammonia, starting from the actual results obtained in large-scale practice by carbonization at different temperatures in gas-works (with and without steaming), carbonization in coke-ovens, and gasification with air and steam. The lecturer proceeds to connect up these results with what has been learned by laboratory experiments on the processes involved in the formation of ammonia from coal and coke, using different temperatures and atmospheres. The conditions of formation and destruction of ammonia are both discussed, with final reference to synthetic ammonia processes. In this regard the closing words of Prof. Cobb are: "It is permissible to wonder what will be the relative position of ammonia from coal and synthetic ammonia if those who are dealing with the process of carbonization and gasification on the one hand, and with the technical and scientific difficulties of the synthetic process and its possible developments on the other, strain every fibre to keep their place; but no room for speculation remains if slackness becomes the order of the day on either side."

* "Coal and Its Utilization." A Series of Lectures delivered in the Department of Fuel Technology at Sheffield University. London: "Colliery Guardian" Company, Ltd. Price, 5s.

Gas and Coal Consumption Calculations.

Engineers of various gas companies in Indiana have compiled figures showing the saving in coal consumption, by the average family in the State, which would result from the replacement of coal with gas. This amounts to from 8 to 11½ tons of coal a year. In a statement he has published on the subject, Mr. E. J. Burke, the Secretary of the Indiana Gas Association, says that, if a household consumes 5000 c.ft. of gas a month, which is more than the average domestic use, there would be required to make the year's supply of gas by the water-gas method of manufacture a little more than a ton of anthracite and about 200 gallons of oil, or 6 tons of bituminous coal if made by the coal-gas process. This quantity of gas, burned with due regard to the avoidance of waste, would do all the family cooking and operate a gas water-heater. The average family who do their cooking on a coal-range winter and summer, burn from ¾ to 1 ton of coal a month. The range also heats the hot-water tank. This family, then, consume 9 tons of coal a year, taking the lower figure as the basis of estimate. The water-gas process therefore saves the consumption of many tons of coal in the year by this family, but this necessitates the use of considerable oil, of which at present there is an abundant supply. If coal gas is furnished to the family, there will be used in making the year's supply of gas about 6 tons of soft coal, which is much easier to obtain than anthracite. However, the community saving in domestic fuel will be even greater than is the case when water gas is burned; for the 6 tons of coal, having yielded the gaseous product in the retort, will be withdrawn as about 2½ tons of coke, having high fuel value.

Manchester and District Junior Gas Association.—A visit has been arranged for Wednesday afternoon, Dec. 6, to the works at Trafford Park, Manchester, of the Lancashire Dynamo and Motor Company, Ltd. After the inspection, an official of the Company will read some notes on "The Suitability of Construction of Motors for Gas-Works."

GAS ACTS FOR 1922.

[FIRST ARTICLE.]

WE commence to-day a review of the Gas Acts passed during the last session of the now defunct Parliament; but it is not intended to do anything more than note variations from the Bills as introduced, unless points occur which require the emphasis of repetition. The Acts which are noticed this week were surveyed in the "JOURNAL" for Jan. 11 (p. 80).

The BIRMINGHAM CORPORATION ACT is the first one. It is a general measure; and there is very little in it which refers to the gas undertaking. We see, in the first place, that the Corporation have secured the clauses regulating the sale of coke in small quantities. They have also obtained the right to apply to the Ministry of Transport to borrow money for various undertakings, among them that of the Gas Department. A later clause gives the Corporation power, if they think fit, to apply money received by them on account of revenue of the gas or any other trading undertaking to the construction, extension, and improvement of the works and conveniences for the purposes of the undertaking, and to the provision of funds for working capital. But there is a clause that money shall only be so applied after the working and establishment expenses of the undertaking and the interest and sinking fund payments in respect thereof have been provided for. Nothing in the Act is to take away or prejudicially affect any of the rights, remedies, or priorities of the holders of gas annuities granted under the Corporation Gas Act of 1875. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The BLACKBURN CORPORATION ACT secures the extension of the borough boundaries. Upon this follows the agreement come to with the Oswaldtwistle District Council for defining the limits of gas supply in one part of the district, and for the purchase on fair market terms of the plant of the District Council used in the service of that particular area. The terms on which this arrangement was to be carried out were noticed when referring to the Bill in the issue of the "JOURNAL" mentioned above. Two or three ordinary clauses succeed, referring to stand-by supplies, anti-fluctuators for gas-engines, and the provision of a valve where high-pressure air is used. The usual clauses appear as to the application of gas revenue, with power to the Corporation, if they think fit, to apply money received by them on account of the revenue of the gas or other undertakings to the construction, extension, and improvement of the works and conveniences for the purpose of their undertaking, as well as the provision of funds for working capital. Power is also taken to recoup any expenses incurred in reconnecting supplies of gas or electricity which have been discontinued through the default of the occupier of any premises. [*Parliamentary Agents: Messrs. Sherwood & Co.*]

In the BOLTON CORPORATION ACT (a voluminous measure), the part dealing with finance contains a provision to the effect that expenses incurred for the purposes of the electricity or the gas undertaking in carrying into execution the provisions of the Act (except such expenses as are to be paid out of borrowed money) shall be defrayed from the revenue of those undertakings respectively. If in any year the revenue be insufficient for the purpose to which it is applicable, the deficiency is to be made up out of the district funds and district rates. Power is given to the Corporation to borrow such sum or sums as they may require for the redemption of any gas annuities which they may agree with any holder to purchase or redeem. Any moneys borrowed under the powers of this section are to be on the security of the revenue of the gas undertaking and of the district fund and district rates. The prescribed period for the repayment of the money so borrowed is not to exceed thirty years from the date of the borrowing, as the Corporation may determine. In the Bill as originally lodged, the period was put at sixty years. Among the miscellaneous clauses is one which extends the provisions of section 91 of the Public Health Act of 1875 to the emission from any chimney of any grit or gritty particles as if they were smoke arising from furnaces. The Corporation have also obtained the power to fit up showrooms and offices for the purpose of exhibiting specimen installations, and of giving demonstrations of the use to which gas or electrical energy can be put; and they may appoint and pay persons for these purposes. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

The CHESTER GAS COMPANY'S ACT (which as a Bill was not, through being deposited late, noticed until the "JOURNAL" for March 1, p. 495) deals with the conversion to a basic price of the maximum prices authorized by the Gas Charges Order issued to the Company in 1921. When the Bill was introduced, the Company asked that, as from the first quarter-day after the passing of the Act, the price charged to ordinary consumers within the city and borough should be 12·2d. per therm, and beyond that area an additional 1·2d. per therm. The clause in the Act provides that to ordinary consumers, within the limits of the city and borough, and any other area within a radius of 2½ miles from the gas-works, the basic price shall be 10·4d. per therm; and in any other parts of the limits of supply it is not to exceed the basic price, with an addition of 1·2d. per therm. In the Bill the Company desired a basic dividend of 6 p.ct. on the ordinary capital issued before the passing of the Act. This has been changed to 5 p.ct. On capital issued after the passing of the Act, they sought 8 p.ct.; but this has been changed to 7½ p.ct. Regarding the division of surplus profits, if in any year the selling price of gas has been below the basic price, and the amount standing to the credit of the net revenue account will permit, the Directors may appropriate an amount equal to one-third of the sum representing the difference between the amount the Company have received in that year, and the amount they would have received in such year if gas had been sold at the basic price; and the money may be applied, in such proportions as the Company shall resolve, for the benefit of the holders of the ordinary capital and of the employee co-partners in the manner provided by the Act. The amount so applied for the benefit of the employee co-partners is not to be less than the amount applied in respect of the same year for the benefit of holders of ordinary capital. In the Bill as promoted, the Company asked for a proportion of "one-half;" but this, as seen above, has been changed to "one-third." Prepayment meter clauses have been inserted, under which, for the hire of a prepayment meter and fittings, the Company may charge a sum calculated according to the number of therms supplied; and the maximum charge is 2·4d. per therm if a cooking-stove is included, and 2d. per therm if a cooking-stove is not included. In the case of the hire of a prepayment meter without fittings, the additional charge is to be a maximum rate of 1·2d. per therm, or at the rate of 10 p.ct. per annum on the cost of the meter, whichever is the higher. Revision powers in respect of the basic price are given to the Board of Trade. Reserve fund and special purposes fund clauses appear; and annual meetings are provided for. A number of miscellaneous clauses are included; but they are quite ordinary in character. Provisions as to profit-sharing appear, as well as a clause giving power to grant pensions, &c. [*Parliamentary Agents: Messrs. Sherwood & Co.*]

The CROYDON GAS COMPANY'S ACT makes provision for the conversion of the capital stocks. In the first place, it is enacted that from and after the passing of the Act the "D" stock issued under the authority of section 4 of the Act of 1904, or of section 6 or section 19 of the Act of 1905, is to be called "Maximum Dividend Stock." Then follow the conversion clauses. These apply to the "A" stock, amounting to £51,600, and entitled to a standard dividend of 10 p.ct.; to the "B" stock, amounting to £178,400, and entitled to a standard dividend of 7 p.ct.; to the "C" stock, amounting to £100,000, and entitled to a standard dividend of 7 p.ct.; and to the "E" stock amounting to £25,000, and entitled to a maximum dividend of 10 p.ct., but subject to reduction in certain events as provided by sub-section 2 of section 6 of the Act of 1905. These stocks it is proposed to convert into the following: £660,000 to be called "sliding-scale stock," and £80,960 of "maximum dividend stock," which latter is to rank *pari passu* with the stock of that denomination authorized by section 4 of the Act of 1904, and section 19 of the Act of 1905 respectively. The sliding-scale stock is to be entitled to a standard dividend of 3½ p.ct. per annum. The standard price to be charged for gas is to be the standard price fixed by paragraph (*a*) of section 3 of the Croydon Gas (Charges) Order of 1921, or by any Act of Parliament or by Order of the Board of Trade amending the same. It is then provided that the Company may increase or reduce the price charged by them for gas above or below the standard price, subject to a reduction or increase in the dividend payable on the sliding-scale as follows: (1) In respect of any half year during any part of which the price charged shall have been above the standard price, the dividend payable on the sliding-scale stock shall in respect of every one-fifth of a penny per therm, or part of one-fifth of a penny per therm, by which the standard price shall have been increased, be reduced below the standard rate of dividend on such stock by 2s. 6d. per annum on every £100 of capital paid up, and so in proportion for any fraction of £100. (2) In respect of any half year during the whole of which the price charged shall have been one-fifth of a penny or more per therm below the standard price, the dividend payable on the sliding-scale stock may, in respect of every one-fifth of a penny per therm by which the standard price shall have been reduced, be increased above the standard rate of dividend by 2s. 6d. per annum on every £100 of capital paid up, and so in proportion for any fraction of £100. From the passing of the Act, the dividend payable on the maximum dividend stock is to be 5 p.ct. per annum, provided that if, in respect of any half year, the dividend paid upon the sliding-scale stock shall be at a less rate than 2½ p.ct. per annum, the maximum dividend stock shall be entitled to double the amount of such dividend on the sliding-scale stock and no more. The succeeding clauses provide for the division of the stock among the different holders of "A," "B," "C," and "E" stocks. A consequent clause to the foregoing rearrangements is that the power of raising additional capital conferred by section 4 of the Act of 1904 and by section 19 of the Act of 1905 respectively, so far as it has not been exercised, may be exercised by the creation and issue either of maximum dividend stock or of sliding-scale stock to rank *pari passu* with the sliding-scale stock to be issued under the provisions of this Act, or wholly or partly by one or more of these modes respectively. The Company are empowered to raise, in addition to any existing authorized capital, further capital to such an amount as will be sufficient to produce, after taking into account premiums or discounts (if any), the sum of £200,000 by the creation and issue of sliding-scale stock, or of new maximum dividend stock. The Directors are given power to issue preference capital at such a rate of interest as they may determine. With the approval of the Board of Trade, the Directors may offer new issues of stock to gas consumers and persons in the Company's employ at, as near as may be, the average

market price in the month immediately preceding the offer, provided that in no case shall the price at which the stock is offered be lower than 5 p.ct. below the average price. This offer may take place before the submission of the stock to sale by public auction or tender. Subsequent clauses provide that the Company may borrow on mortgage in respect of the £204,015 of "D" stock already issued, of the £120,000 of redeemable preference stock, and the sliding-scale or maximum dividend stock issued under this Act, any sum or sums not exceeding in the whole (inclusive of £336,850 already borrowed), one-third of the aggregate nominal amount of such stocks. In addition, the Company are authorized to borrow any sums not exceeding in the whole one-third of the amount of capital hereafter raised. Powers to issue redeemable preference or debenture stock are included. Annual meetings are also provided for. The remainder of the clauses are of usual character. [*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

THE LIMITATIONS OF THE LAW OF INVERSE SQUARES, AS APPLIED TO PHOTOMETRY.

By A. RENFRED MYHILL, A.I.C.

IN determining the candle power of a source of light by means of a photometer, one is sometimes apt to overlook the principles upon which photometric calculations are made, and to apply the law of inverse squares in cases where such an application is not permissible. I refer more particularly to cases where, either designedly or otherwise, the main source of light is reflected, diffusely or regularly, or where secondary sources of light are produced by the incidence of luminous radiation from the primary source; such latter case being found, for instance, when a light is enclosed within a translucent globe.

A few typical examples will illustrate the fallacy of blindly applying the inverse square law to all cases. Strictly speaking, the illumination falling upon a surface is only inversely proportional to the square of the distance from the light source when the said source is a point. In many determinations, particularly of bare or unscreened light sources, without reflectors, this may be assumed to be the case; but in other instances, more particularly when the illuminated surface is near the source of light, the matter becomes more complicated, especially when reflectors or globes are used which have more or less of a focussing or a dispersing effect. To refer to typical cases (which for the purpose of discussion are all extreme or exaggerated instances, such as would not be so marked in actual practice, but which serve merely to illustrate particular points), fig. 1 represents the case of a "point" source of light A, used in conjunction with a plane reflecting surface of matt or rough material placed at R. Suppose D is the bunsen disc of a bar photometer or any surface whose brightness is to be measured at distance d from the source of light. The intensity of illumination on D is that due to two sources—namely, that received from the point A by direct radiation (and, in the case of a surface of size CDB, bounded by the rays AB and AC), and that received by diffuse reflection from the flat surface of R; the latter acting as a secondary source of light. In the case of a reflector of size SRT, this secondary illumination on D is bounded by the rays TB and SC. Thus, the total illumination received on D is not merely represented by the expression $\frac{x}{d^2}$, but is equal to $\frac{x_1}{d^2}$ *plus* another quantity representing the diffusely reflected light from R. (x may be called the effective candle power of the combination, and x_1 the candle power of the point source alone.)

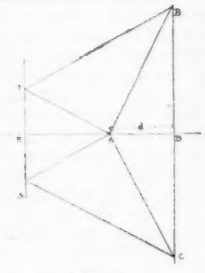


Fig. 1.

It will be seen on consideration that, when AD is large compared with AR, the distance d may be taken as the effective distance between the illuminated surface and the source of light. In other words, for comparatively long distances from the source of light the law of inverse squares holds good (or sufficiently so for practical purposes); but when measurements are being recorded fairly close to the source, care must be taken not to be misled in this direction. For instance, if the illumination produced on a surface 1 ft. away from the light is x foot-candles, it does not follow that that produced 10 ft. away will be $\frac{x}{(10)^2}$—an assumption which would be correct in the case of an unreflected point source of light. The illumination of such a surface must be determined directly at that particular distance.

Fig. 2 illustrates a case where the source of light is situated near a concave reflector made up of a white background coated nearest to the light with a clear glaze or transparent enamel. Such a reflector emits regularly reflected and diffusely reflected light. As the reflector is concave, the regularly reflected light may be in a parallel, a convergent, or a divergent beam, according to the position of the primary source of light. Taking the case in point, the light source is situated between the principal focus of a spherical concave mirror and the mirror itself, thereby producing a reflected divergent beam as well as diffused

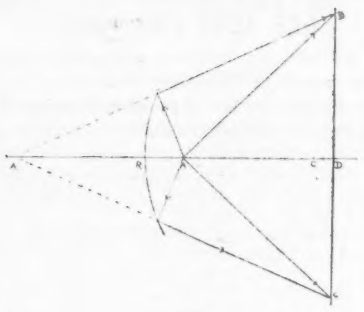


Fig. 2.

reflection from the matt background of the mirror and direct light from the primary source itself. In other words, the surface CDB receives its illumination from three sources—viz.:

(1) From the point of light itself; this component being equal to $\frac{x}{AD^2}$.

(2) From the matt surface of the reflector which lies beneath the glaze, and which acts as a secondary source of light.

(3) By regular reflection caused by the polished or glazed front surface of the reflector, the intensity of illumination being inversely proportional to A_1D, where A_1 is the position of the virtual image of the light source in the mirror. Such intensity therefore is equal to $\frac{x_2}{(A_1D)^2}$ where x_2 is the hypothetical candle power of the bright reflection in the mirror.

In this case, the total light received on the surface is the sum of these three components, and obviously cannot be accurately expressed by the term $\frac{x}{y^2}$. Therefore the law of inverse squares cannot be blindly applied. In the previous case, however, when D is a comparatively long distance from A, the law approximately holds good.

Fig. 3.

Taking a further instance, fig. 3 represents the example of a point of light A, situated at the principal focus of a concave mirror of highly polished metal, assumed to reflect regularly. (If the surface of the reflector is part of a sphere, and of small dimensions relative to its radius of curvature, the point A will be approximately half way between the surface of the reflector and its centre of curvature.) Such a combination will emit light in two ways—first, as a direct set of rays proceeding in all directions from and around A; and secondly in the form of a parallel beam of reflected light from the surface of the reflector. The illumination, therefore, on a plane surface placed at right angles to the axis of the reflector will be equal to

$$\frac{\text{Candle power of A}}{(\text{distance from surface})^2} + \text{a constant.}$$

The constant referred to is that due to the parallel beam of reflected light from the surface of the reflector, which, neglecting the slightly absorptive effect of solid particles in the atmosphere, may be considered as giving a constant illumination, when taken alone, on a surface placed normally *at any distance* along the axis.

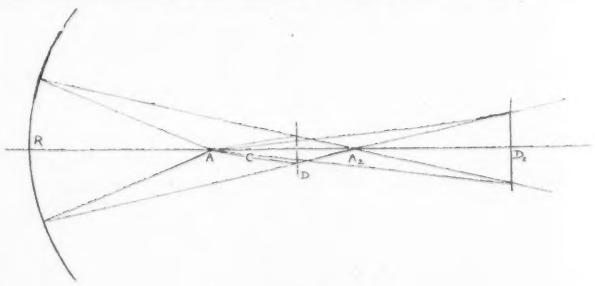


Fig. 4.

It is therefore evident that if the law of inverse squares were applied to determine the candle power of the combination by observation of the illumination of a surface and the distance of that surface from the source of light, higher apparent candle-powers would be obtained when the surface was a comparatively long distance from the light (*e.g.*, when a low candle-power standard lamp was being used for comparison, or when a long bar photometer was used) than when the illuminated surface was comparatively near.

Taking, now, a still more accentuated case, illustrated in fig. 4,

we have the same combination of concave reflector having no diffuse reflection, and a point source of light; but in this case the latter is situated between the principal focus and the centre of curvature. Here we get a converging beam of light reflected from the mirror, such beam being brought to a focus at A_2 in the sketch. Taking a surface in the position D_1, its intensity of illumination is equal to that directly received from A, which may be expressed as $\frac{x}{(AD_1)^2}$ *plus* that received by regular reflection from the surface of R. Since such rays are brought to a focus at A_2, this amount becomes $\frac{x_1}{(A_2D_1)_2}$. In the case of a surface in the position D_2, as shown in the sketch, the illumination $= \frac{x}{(AD_2)^2} + \frac{x^1}{(A_2D_2)^2}$. It will be seen that the reflected component gives greater illumination intensity as the surface is moved further away from the source of light, until the point A_2 is reached, after which the illumination becomes less as the surface is moved still further away.

In an instance still more exaggerated—viz., when the direct light is shielded from the illuminated object and only the reflected beam is allowed to strike it—the total illumination received becomes greater as the distance is increased until the focal distance of the beam is exceeded. Such a case might occur in taking the illumination immediately beneath an upright gas-fitting carried on a bracket, and having a bright concave metal reflector immediately above it; the part of the fitting immediately beneath the burner obscuring all the direct rays and allowing none but regularly reflected light to reach the surface which is illuminated.

In conclusion, the examples given above emphasize the important point, well known to good illuminating engineers, that the illumination which a given source of light will produce on surfaces placed in certain given positions—*e.g.*, walls, floors, ceilings, &c.—cannot be accurately calculated unless the conditions under which the polar curve of the light was obtained are comparable with those which are to obtain in practice. As a typical example, it is a bad practice to test large lamps, which are to be used for outside illumination at a distance, by means of a short-distance photometer. It is, of course, not always possible to test under such ideal conditions; but the aim should be to adhere as closely to them as the space at one's disposal will permit.

INSTITUTION OF MINING ENGINEERS.

The Annual Meeting of the Institution was held, on Thursday and Friday of last week, at Burlington House, Piccadilly, under the presidency of Prof. Sir John Cadman, K.C.M.G., D.Sc.

Explosions from Coal Dust.

Sir JOHN CADMAN, in the course of his address, emphasized the value of the many investigations that had originated directly through the Institution or indirectly through its members. The death rate among miners in Great Britain was much less than that in some of the large coal-producing countries of the world; but in spite of all possible precautions having been taken that skill and forethought on the part of all employed could suggest, there still remained an element of danger in connection with coal mining. This danger it was the special duty and privilege of the members of the Institution to assist in removing. He proceeded to indicate matters in which a forward move appeared to him desirable; the first being in connection with the problem of explosions from coal dust. In spite of all the knowledge now available, he said, disasters from this cause continue to occur; and the Institution could not do better work than by setting itself to abolish this menace once and for all. Coal dust should be regarded as the small-pox of the mine, and every mine should be vaccinated by adequate and repeated stone-dusting. Another thing of importance to secure was the representation of the Institution at all public inquiries held with regard to explosions in coal mines.

In conclusion, he referred to the collaboration of the Institution with the Institution of Mining and Metallurgy, and to the fact that the two Councils, on the recommendation of a Joint Advisory Committee, had adopted a proposal for the formation of an Empire Council of Mining and Metallurgical Engineering.

The Disintegration of Coal by Acids.

Dr. R. LESSING, F.C.S., in a paper bearing the above title, dealt with a very important subject from the point of view of the constitution of coal. In the course of his researches in the latter direction, and in particular on the mineral constituents of coal, he investigated the treatment of coal with acids. Strange to say, although acids had frequently been used for analytical purposes in connection with powdered coal, samples of coal in lump form or in compact masses had never been so treated. Dr. Lessing made the interesting observation that when coal is treated with acids of any kind, of a strength which will not attack the coal substance proper, the bond which cements together the particles forming coal is loosened, and the lump of coal can be crushed by the pressure of the fingers. This observation is of importance in the study of the constitution of coal, as such a treatment facilitates its separation into its constituents—like fusain, durain, clarain, and vitrain, as well as extraneous "dirt."

An acid which Dr. Lessing found convenient to use, and which penetrates the mass of coal more readily than liquid acids, is gaseous sulphurous acid. The method was used in the first instance for investigating in detail the ash constituents of two coals, and a great number of fractions from these coals.

The results led Dr. Lessing to suggest that the process should be employed for the improvement of the existing coal-washing processes. It is well known that a good deal of dirt remains in washed coal, by being combined with pure coal in complex particles. This combination is resolved by the acid treatment, and the removal of the dirt according to its specific gravity is made easier. He went on to say that the tendency of modern methods of coal refining is undoubtedly one aiming at a complete elimination of the removable ash. In order to bring about this desirable object, far-going disintegration is essential; and this can be brought about—or, at any rate, assisted—by an acid treatment. This will be particularly helpful when it is a question of splitting coal into its coking and non-coking components—a procedure which, in view of the gradual exhaustion of our best coking coal, will have to be contemplated as within practical politics ere long.

At the conclusion of the paper, an actual demonstration was made by Dr. Lessing of the action of sulphur dioxide on compact coal. Into a block of coal weighing 3½ cwt., a gas-tube was inserted, through which 4 oz. of sulphur dioxide was allowed to bubble at ordinary pressure. At the end of this treatment, the block was broken up into fragments without the aid of any tools. No smell of sulphur dioxide could be detected in the room. Experiments applying this method to the winning of coal, carried out in several mines, were described by the author; and the question of safety was discussed.

An interesting discussion ensued, in the course of which Mr. Thacker stated that he thought Dr. Lessing's results would bring us to the threshold of the solution of the problem of spontaneous combustion of coal. Messrs. Graham and Henshaw paid tribute to the importance of the proposals; the latter mentioning that the process might do away with explosives, alleviate spontaneous combustion, and lead to the reduction of sulphur in coking coal. Dr. W. Hulse, the Manager of the Brereton Collieries, where one set of trials was carried out, confirmed the entire absence of smell or objectionable gases in connection with the experiments underground. Col. W. E. Blackett criticized scientific men bringing immature facts before them, because it did them no good. Scientists were going to bring before the public that it was no use having large coal, but that the right thing was to disentegrate it. South Wales did not know what to do with its small coal, which was almost a waste product; and they were trying to deal with this, and make it a larger quality for practical use. He urged these scientific gentlemen to bring them some idea to glue coal together, and not to separate it. Mr. Dron said they appreciated the work which was being done by the chemists, and they, on the practical side, did get a grain of gold from it. They wanted all the facts they could get. Col. Blackett: That is what I say. We want the facts and not the fancies.

In a spirited reply to Col. Blackett, Dr. Lessing pointed out that the teachings of science must be brought to the notice of practical men at the earliest possible moment, in order to stimulate progress. He invited the hearty co-operation of practical mining engineers in assisting with their experience in the working-out of his proposals.

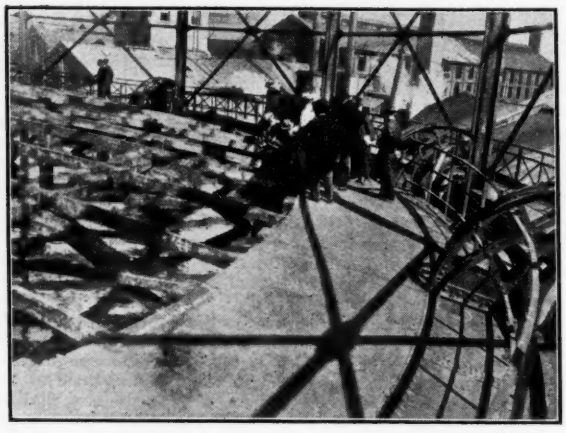
Pulverized Lignite as Boiler Fuel.

The fault of the enormous Australian deposits of brown lignite coal, like that of all lignites, is the excessive amount of water it contains. When to all appearances it is perfectly dry, there is still in it over 40 p.ct. of moisture. On account of the importance of finding some practical way of dealing with these low-grade lignites, some 4 tons of South Australian brown coal were sent for testing to the Powdered Fuel Plant Company, Ltd., of No. 47, Victoria Street, London, S.W.; and an account of the investigation has appeared in the pages of "Engineering." The following is the analysis of the fuel: Moisture, 45·04 p.ct.; volatile matter, 27·19 p.ct.; fixed carbon, 19·58 p.ct.; and ash, 8·19 p.ct. Passed through a turbo-pulverizer and fed into the boiler-furnaces, the combustion was very poor; and it was therefore decided to try the effect of giving a preliminary drying to the lignite before pulverization. This was so successful that a report has been submitted by the Company to the effect that the lignite coals of South Australia can be satisfactorily used for steam-raising if burnt in pulverized form after a preliminary drying to reduce the moisture content to something like 15 p.ct. This would be effected in rotary kilns heated normally by the waste flue gases, but arranged for an auxiliary powdered fuel burner as well. Each boiler would be equipped with a Stein recuperative air heater and a turbo-pulverizer. The recuperative air heaters would be similar to that which has now been working in the Hammersmith power station for about two years. This is composed of hollow firebrick blocks through which streams of air and flue gas pass on the counter-current principle. The outgoing flue gases are reduced by about 200° Fahr. in their passage through the heater, and the heat they give up to the incoming air raises the latter to 300° Fahr. In this case the whole of the air required for the furnace is not preheated.

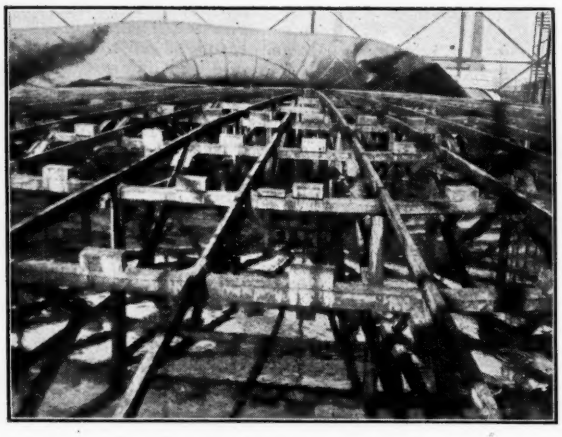
GASHOLDER DESTROYED AT OSAKA, JAPAN.

Failure of Crown Plates.

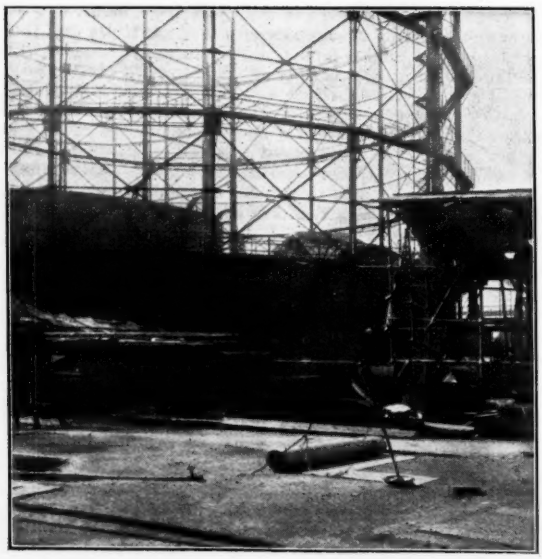
A serious accident occurred on Sunday morning, Oct. 8, at the works of the Osaka (Japan) Gas Company, when, following the failure of a portion of the crown plates, the gas contained in a million cubic foot holder caught fire, and more or less seriously burned a number of persons who happened to be in the vicinity. For some time a 2 million c.ft. holder near by was in imminent danger. The gas at some points became ignited; but engineers and workmen, at great risk, climbed up and stopped the leaks with mud and clay. It was stated that the destroyed holder was in a condition necessitating very frequent repair.



Source of the Trouble under Examination.



The Rolled-Back Crown Plates.



The 1-Million C.Ft. Holder in foreground. The Endangered 2-Million Holder behind.

Forwarding the accompanying snapshots of the holder before and after the accident, Mr. E. J. B. Tully (who is at present erecting a 2 million c.ft. Tully gas-making installation at Kobe) says the structure was about fifteen years old. Two men were engaged patching the top of the crown; and while they were standing there a crown plate gave way, tearing the crown from the joint, so that the holder descended with a run. While slipping down the columns, a spark was caused, and this ignited the gas. Mr. Tully, in his letter, suggests, as an explanation of the accident: "The crown plate gave way from No. 2 plate on top. Say the first ring is $\frac{3}{8}$ in., the next $\frac{1}{4}$ in., and the next $\frac{1}{16}$ in.; the $\frac{1}{16}$ in. plate rips away from the $\frac{1}{4}$ in., with the crown pressure. The holder going up and down, the $\frac{1}{16}$ in. plate moves a little; and so after a few years this plate gets rusty inside, and becomes so thin with the movement of the crown, that it cracks near the joint. I think the crown only moves at that point." The plate, he adds, should therefore be examined at this spot.

COKE FOR FOUNDRY WORK.

Mr. A. D. Young, Engineering Assistant in the Burnley Gas Department, in a paper before the Lancashire Branch of the Institution of British Foundrymen at Manchester, stated that, generally speaking, there seemed nothing so far that resembled a standard specification for coke for industrial purposes, and particularly for coke used in foundries. Managers of foundries needed a coke that would be freely combustible for cupola practice. The combustibility of coke used for metallurgical purposes was influenced by the graphite film on the pores of the coke, its content of volatile matter, its porosity, the areas of internal surfaces of cells, and the character of the cell structure. The author defined the physical properties of a good foundry coke as well-developed cell structure, sufficient hardness, suitable size, and non-friability, while the chemical properties were high carbon content, low ash content, low sulphur and phosphorus content, and low moisture content. Laboratory tests for the estimation of these properties were described at some length.

From the point of view of the iron founder, the determination of the crushing strength of coke was not a satisfactory hardness test. For foundry work a coke was required which had not only a hard cell structure, but one which, though it might break-up from large lumps to smaller pieces, would not crush down to small stuff, and thus cause the clogging of the cupola. Up to now, no universally accepted method for the mechanical testing of coke had been devised, though several machines had been invented in this country for hardness testing. In the United States the "shatter" test had been adopted by the Bureau of Mines, and was used to determine the relative breakage of the coke. This test consisted of dropping a sample four times on to an iron plate from a height of 6 ft. The coke was then screened over a 2-in. mesh. That remaining on the screen and that passing through were weighed separately, and the amount of breakage thus determined. A coke with a high ash content would give a greater unburnable residue; and thus cheapness in price might be more than discounted by the extra amount of coke required, and the additional quantity of slag resulting.

It was necessary, said the author, in reply to questions, that they should have a coke with a certain percentage of porosity, but, at the same time, sufficient hardness and sufficient strength for the purpose for which they required it. Regarding the point of cell area exposed to the gases, there had not been a great deal done up to the present; but he was inclined to think that this was going to be a big thing in the future in relation to the combustibility of coke. If they could get a coke of the same strength with a bigger cell area, so much the better for the user. The bigger the cell area, the more combustible it was. Asked what would be the atmospheric effect on coke that had stood in the open for twelve months, Mr. Young replied that the general opinion was that coke took no harm through being stored in the open, provided it did not get wet. There was nothing in the coke to alter. The only possible effect might be a tendency for the coke to break-down into breeze, in which case it would certainly not stand as well in a cupola.

Scottish Junior Gas Association (Western District).—A visit has been arranged to the Helensburgh Gas-Works, on Saturday, the 25th inst., members travelling by the 2.13 p.m. train from Queen Street, Glasgow. There will be a business meeting in the Royal Technical College, Glasgow, on Saturday, Dec. 9, at 7 o'clock, when Mr. A. Kay, of Glasgow, will read a paper on "Water Heating by Gaseous Fuel." The annual smoker will take place in Cranston's Tea Rooms, Queen Street, Glasgow, on Saturday, Dec. 23, at 6.30 p.m.

North of England Gas Managers' Association Auxiliary Meetings.—The seventh half-yearly auxiliary meeting of the Association will be held in the gas offices, Grainger Street, Newcastle-on-Tyne, at 2 o'clock next Saturday afternoon, Nov. 25, with Mr. W. E. Oulds, of Tynemouth, in the chair. Two papers will be submitted—one by Mr. A. Bell, of Morpeth, on "The Making of Gas and Water Connections under Pressure, and the Uses of Some Modern Tools and Appliances in Gas Manufacture and Supply;" and the other, by Mr. E. F. Craggs, of Newcastle-on-Tyne, entitled "Gas-Fired Bakers' Ovens."

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

Autumn Meeting in Birmingham.

THE Autumn General Meeting of the Midland Association of Gas Engineers and Managers was held on Thursday, the 16th inst., at the Grand Hotel, Birmingham. Mr. W. H. ADAMS, the retiring President, occupied the chair.

NEW MEMBERS.

Two new members were elected: Mr. Charles George Alan Howard, of Woburn, and Mr. John Gibson Cleator, of Cirencester.

AN HONORARY MEMBER.

Mr. Vincent Hughes, late of the Smethwick gas undertaking, was elected an honorary member of the Association.

The CHAIRMAN said the honour was due to Mr. Hughes for his past services to the Association; and Mr. J. Ferguson Bell, in the course of a letter, pointed out that for many years Mr. Hughes had been an active member of the Association, and had rendered good service.

ELECTION OF PRESIDENT AND OFFICE BEARERS.

The PRESIDENT submitted the name of Mr. P. N. Langford (Coventry) for the presidency.

Mr. J. PATERSON seconded the motion; and the resolution was heartily endorsed by the meeting.

Mr. LANGFORD, in acknowledging his appointment, promised to do everything in his power to make the ensuing year a successful one in the record of the Association.

Mr. C. H. Carder, of Oldbury, was elected Vice-President; and the following were appointed Members of the Committee, to replace those retiring by rotation: Messrs. J. W. Allin (West Bromwich); E. B. Tomlinson (Birmingham); W. Wilson (Burton-on-Trent). Messrs. C. Rhodes Armitage (Newcastle, Staffs.) and Frederick Shewring (Stratford-on-Avon) were elected Auditors, and Mr. T. Thornton (Rowley Regis) was appointed Hon. Secretary and Treasurer.

EDUCATION SCHEME.

Mr. WALTER HOLE then explained at some length the scheme for the future education and examination of those engaged in the technical work of the gas industry. He dealt first with the scheme as it applied to students within reach of a Technical Institute, which took Gas Subjects as part of its curriculum; and, on the subject of the examination for the ordinary certificate, he said a valuable concession had been obtained from the Board of Education. The concession was that the Institution of Gas Engineers would be allowed to appoint assessors, who would review the questions proposed to be submitted to students at individual technical institutes, thus ensuring a uniform standard. There must also be uniformity in the standard of marking; and this would be safeguarded by the teachers who had marked the script forwarding it to the assessors for their confirmation. This, he admitted, was not an ideal arrangement; but it was a valuable concession to have obtained, and he hoped it would be accepted for the time being. Section II. of the scheme referred to students who might be in touch with technical institutes which did not include gas subjects as part of their curriculum. During the previous week he was in Cornwall, and he discovered that, while there were a large number of institutes, not one of them took Gas Engineering or Gas Supply. He found that in 1913, when the high-water mark was reached in relation to Gas Engineering subjects taken at technical institutes, only 27 institutes throughout the country included such subjects. When they considered the distribution of those institutes, the position was even worse, for nine were in Yorkshire, three in Lancashire, and ten in London. There was not one technical institute taking gas subjects in the eastern counties, in Wales, or in the large area known as the south-west and west. To meet this condition, it had been provided that any student attending an approved technical institute where cognate subjects were taught, when he had reached the same standard as would be reached by a student in institutes having a course in gas subjects, could write to the Institution of Gas Engineers and state that he wished to be examined in Gas Engineering or Gas Supply. Arrangements would then be made for the student to do so. Section III. applied to the highest and best type of student—the most intellectual class. The examination for the diploma would be of a very high order indeed. Several new features had been introduced into this section. To begin with, it was the only section in which a certain minimum standard of general education had been insisted upon. Other features of the scheme were that there was both a written and oral examination, and that students sitting for the diploma examination must have written an original paper on some point connected with the business. The scheme, he claimed, was one which could not fail to be for the improvement and welfare of the industry as a whole. Assuming that it appealed to them as a well-rounded and statesmanlike scheme, he would be glad of a resolution of approval, so that the Council of the Institution might know that they had the general support of the District Institutions of the country.

The PRESIDENT remarked that if such a scheme had been in existence in his younger days, he would probably have been a better man and possessed a greater knowledge of the work of the gas engineer.

Mr. GEORGE HELPS (Nuneaton) said the scheme was doubtless of the utmost importance; but in his opinion, unless it was tacked on to daily practice, it was waste of time and money. He thought it ought to be insisted, before a student sat for examination, that he served for a certain period at a works.

Mr. HOLE interrupted Mr. Helps to inform the meeting that a condition such as was suggested would be enforced.

Mr. HELPS expressed the opinion that they would never beat the old system of apprenticeship in equipping men at all points for their calling.

Mr. J. PATERSON proposed a resolution approving the scheme outlined by Mr. Hole, on behalf of the Institution of Gas Engineers. He agreed that experience at the works was invaluable, but said the student needed instruction in the rudiments; and the only way it could be obtained was by going to some educational centre. At last they had a scheme providing for the education of students which seemed to be the most suitable that human skill and ingenuity could have evolved. It was often felt that it was not right that the teacher should be the examiner; but the modern tendency was towards this practice, and there was a great deal to be said for it. He feared there might be difficulty in the work of the assessors. He took it that the Board of Education felt it was a practical proposition. He wondered whether the teacher who was also the examiner in the elementary grade was not going to feel that his authority or prestige would somewhat be called into question. The idea of assessors in order to ensure uniformity was desirable; but it was the actual control which might, he thought, give rise to possible difficulties. He did not notice who appointed the assessors; but generally the scheme seemed to be admirable for the training and education of the young men of the industry. It was taking the place of something which had hitherto existed in an imperfect and fragmentary way; and if the outcome would be the advent of a number of young men in the industry who would hold the Institution diploma, they were going to have men who were alert, technically trained, and who would help forward the industry in a very marked way.

Mr. HOLE, in reply, stated that, as to the assessors, it was agreed there were difficulties; but the suggestion came from the Board of Education, and they were assured that it had worked satisfactorily in other directions. It was not the first time that assessors had been appointed. The Institution of Gas Engineers would appoint the Board of Examiners, and the assessor might be one of that Board. If that were so, he would be appointed indirectly by the Institution. The assessor might, however, in certain circumstances be one who was not on the Board of Examiners; and he presumed he would be appointed by the Advisory Committee, If the teachers felt any difficulty in the matter, provision had been made for their representations to be heard at once, in and through the Advisory Committee. If the scheme worked in any way unsatisfactorily to them, they had only to make their representations to the consultative committee. While he recognized the difficulties, he also saw it was important that there should be, roughly, a uniform standard. All this referred, of course, only to the first examination. For the higher certificate, the question would be settled by one of the Board of Examiners appointed by the Institution of Gas Engineers. A long notice had to be given in regard to anyone who wanted to be examined under section II.; the reason was that the Board of Education wanted to be in a position to put pressure on local technical institutes to start gas engineering courses wherever there was an adequate number of potential students. It was hoped that the number of institutes would be multiplied indefinitely.

Mr. F. C. BRIGGS (Dudley), in seconding the resolution, said he appreciated the difficulties of students in finding the right courses for study; everything should be done to prevent their time being wasted. The gas industry was to be congratulated on the working-out of this sensible scheme.

Mr. C. F. W. RENDLE (Redditch) pleaded, on behalf of the junior engineers, for admission to the senior body of men passing the full examination.

Mr. DAVIS said he was generally in favour of the scheme, though he felt that the conditions in relation to the first three years were hardly elastic enough. He did not think it should be necessary for youths who had had a good deal of practical experience to have to revert to study, in all sorts of general subjects, because they had neither matriculated nor held the certificate of a secondary school. Then, again, what real benefits would accrue from the possession of the diploma?

Mr. C. H. CARDER (Oldbury) said it appeared from an examination of the scheme that a student would choose either the chemical or the engineering approach to the study of gas engineering. He would probably get a certificate in gas engineering which might be a certificate in gas-works chemistry applied. He thought it should not be possible to get a certificate in gas engineering unless a student had passed an engineering examination, neither should a man be entitled to a certificate in gas engineering unless he had passed a chemistry examination. The certificate should be for proved all-round knowledge. It was not sufficient

to differentiate in this manner. A man should not get an engineering certificate with chemical knowledge only.

Mr. HOLE, again replying, pointed out that the school leaving certificate did not involve a long course of study. It was inadvisable, in his opinion, to lower the educational standard. As to the criticism that too many "discretions" were allowed as to subjects, he said there was power to deal with any special cases. Regarding membership of the Institution, the whole trend of the scheme was, he thought, that in the course of a few years the holding of the diploma would be one, not the only one, of the requirements for membership of the Institution. He hoped this would be so, though he knew there were differences of opinion on this point. Therefore, this matter was not included in the scheme. Let them get the scheme to work and see what the results were. Super-refinements could be added later.

The resolution was carried unanimously; and the President, on behalf of the members, expressed appreciation of the visit of Mr. Hole.

Mr. T. H. POULSON then read the following paper:

RE-ORGANIZATION OF THE STAFFORD DISTRIBUTION DEPARTMENT.

In submitting a short paper on the re-organization of the Distribution Department at Stafford, I do not suggest that our department has yet by any means attained the ideal; but I am satisfied that a sound foundation has been laid for a well-organized distribution department.

REASONS FOR A COMPLETE RE-ORGANIZATION.

It would perhaps be well to give our reasons for beginning a scheme of complete re-organization.

(1) There was practically an absence of reliable managerial statistics. I say managerial in order to distinguish the statistics which are essential to efficient management from those prepared purely for final accounts, and which I maintain are of little value for the manager's daily requirements. The only information we obtained regarding the actual financial working of the distribution department was in the form of the statutory accounts received a month after the close of books, or thirteen months after the first expenditure.

(2) We knew nothing of the efficiency and productivity of the workmen. So little did we know, that the first analysis, after the preliminary tests had been made, showed that the fitters and their mates were working approximately only 70 p.ct. of the day. We can now claim 85 p.ct., and hope for further improvement.

(3) In estimates given for fixing apparatus, the net result of profit or loss on the particular work could not be ascertained. In one case we tested, the estimate of £25 had been given; but the actual cost worked out to three times this amount.

(4) A further important reason was that we wished to develop sales, and we knew it would be absurd to attempt to increase the output of appliances while fixing charges were so high. Thus we determined to put our house in order, so that no obstacle could impede our progress when development commenced; and we decided to consult the Commercial Organization Section of the "B.C.G.A.," who sent a representative to make a thorough investigation of the methods in practice, and who subsequently submitted a detailed report.

At this time the staff consisted of 42 men; and it was proved that the Superintendent could not alone supervise men, allocate their work, check their time, and at the same time develop sales on the district. A foreman was therefore appointed from among the fitters to undertake the supervision of the men, the allocation of their work, to give estimates upon the district, and to follow up minor inquiries. The new arrangement left the Superintendent free to develop sales generally and to deal with other important matters.

RESULTS OF THE NEW SYSTEM.

Next we introduced the job voucher system, as recommended by the "B.C.G.A.," which we found required the minimum amount of clerical work and gave the maximum amount of information and statistics upon which we could frame future plans for further development. The new system resulted in smooth working from the beginning, and has for its aims:

(1) To reduce clerical labour on the part of the fitters and the Superintendent.
(2) To provide a check upon workmen's time.
(3) To provide figures for easier supervision by the Superintendent, especially in regard to unproductive time.
(4) To give a more accurate record of each job and the expenditure thereon.
(5) To provide a correct record of stock from week to week.
(6) To allocate labour and material to the statutory accounts.
(7) To permit of more detailed allocation for managerial information, together with each section's proportionate establishment charges.

PROCEDURE.

The procedure of the system is briefly as follows: A voucher is made out for each job or complaint wherever it is received, and the same voucher runs through each section until the job is completed. Every voucher is sent to the distribution clerk. The vouchers for the jobs requiring material are then passed to the foreman for his inspection of the job; and he enters all the material that will be required. This procedure ensures that the fitter is sent out to each job with all the materials he requires. This avoids annoyance to the consumer, and the waste of the fitter's time by his having to return for additional material. The requisite material is prepared by the storekeeper, and is put into a rack bearing the job number.

The foreman then allots the jobs to the fitters by sorting the vouchers into a rack in the order in which the jobs are to be executed. The vouchers are clipped into a handy pocket case, together with a work summary for the day. The daily clerical work of the fitter consists of entering on the summary the time he arrived and the time he left each job, and of making on the voucher a report of the work he has done. The pocket case is returned each evening, when the summary and completed vouchers are certified by the foreman and passed to the clerk.

The times shown on the summary are extended, and walking and stores times are averaged over the jobs of the day, and the totals of each job priced to equal the total wages paid to the man. When the job is complete, the labour is totalled on the voucher, the material used priced, on-cost calculated, and the expenditure summarized in the costing portion of the voucher under its proper allocation.

It will be seen that by this method we have on the voucher a complete history and record of the job, consisting of:

(1) Origin of inquiry.
(2) Fitter's daily report.
(3) Fitter's time and value of labour.
(4) Material issued, used, and its value.
(5) Particulars of meter fixed and/or removed.
(6) Particulars of appliance fixed and/or removed.
(7) Accurate summary of costs divided under—

(*a*) Labour, (*d*) Delivery,
(*b*) Material, (*e*) Expenses,
(*c*) Appliances, (*f*) On-cost,

and, in the case of chargeable work, the amount chargeable to the consumer. This shows the accurate profit or loss on each job in all cases where a tender has been submitted.

These costs are summarized into a cost book under as many sub-divisions as may be considered of value to the management, and not under the statutory allocation only. For example, we have a statutory allocation "Repair and Renewal of Stoves." I do not know what expenditure was hitherto put into this account—in fact, I believe (unofficially) it was the "dust bin" of all expenditure which could not be put elsewhere; and even then a lump sum was entirely useless except for balance-sheet purposes. For example, could any manager frame future policy on the single fact that (say) £1000 had been spent during any year in "repair and renewal of stoves?" This amount might possibly have included many items which had no reference to stoves. Besides, it must be remembered that the £1000 accounted only for labour and material, and did not take into consideration the important matter of establishment charges.

It has occurred to me that formerly we left such vital matters as the allocation of expenditure of revenue or capital to the discretion of a clerk, and in some cases to the fitter, when he allocated his time. Under the new system a summary is received showing the expenditure of: Labour, material, appliances, delivery, minor expenses, establishment for fixing cookers, fires, hot-water appliances; and separately for exchanges, repairs on the district, repairs in the shop, minor adjustments—commonly known as "complaints on the district." In addition to this, the allocation of wages is now accurately costed in minutes, whereas formerly this was left to the discretion of the fitter, who booked his time in hours. This information is of great value, because it gives a reliable basis upon which future policy can be framed. Incidentally the cost of fixing or exchanging apparatus is now under daily observation.

We can obtain the accurate profit or loss made on fitting work, and, in addition, we have the figures divided under the various classes of chargeable work. This information is available daily if required; but even if only taken monthly, it is a better guide than a yearly statement, which is usually incomplete, or in a tangled form for balance-sheet purposes.

CHIEF ADVANTAGES OF THE COST BOOK.

I fear that it would take too long for me to go more minutely into an explanation of the details of the costing section of the job voucher system; but it will probably be interesting if I summarize the main advantages of the cost book.

(1) The expenditure on every job under the headings of labour, material, appliances, transport, expenses, and on-cost, can be collected under as many costing headings as may be desired.

(2) The figures obtained from the costing allocations permit of a combination of any sets of figures to make up a statutory account, which means that these are controlled by the management, instead of by a clerk, without incurring any detail work for the executive.

(3) By a simple system of charging on-cost, the exact expenditure is obtained, rather than only productive expenditure.

(4) The chargeable cost book shows the profit or loss on each job from day to day in the various classes, instead of merely under the one heading of what is generally known as "fitting work." We have found that it is not sufficient to know the net profit made on the whole of the chargeable work, but that it is requisite also to know the gross profit or loss on each section, because a net profit consisting partly of gross losses in certain sections must mean excessive gross profits in other sections.

(5) In addition to the allocation of costs, the cost book gives an

analysis of jobs. For example, fixing meters can be analyzed into the various sizes, so that for any period the number of each size fixed, exchanged, or removed, under slot and quarterly, and similar information in regard to cookers, complaints, &c., is easily obtained.

(6) Further to this, we have an analysis of time. The cost book shows the time spent by each man on each job, so that averages may be obtained by which not only can the men be supervised, but upon which estimates can be based.

If we agree that an allocation of expenditure under various headings is essential to efficient management, we must see that the figures are as accurate as possible, and yet valuable in relation to the cost of obtaining them.

I can anticipate the first thought that has occurred to you. "What does all this cost in clerical labour?" As a matter of fact it is less than formerly. In addition, allocations are made under 21 headings, against 8 under the old order. The saving lies in the fact that the Fittings Day Book, Stores Transfer, Mains and Services Book, and many others have been scrapped.

UNPRODUCTIVE TIME.

I have referred to unproductive time; and I now propose to deal with this important question. By unproductive time is meant all the time spent by the workmen other than that actually devoted to the job. A certain amount of unproductive time is, of course, unavoidable; but it is essential that a very careful check should be kept upon this expensive item. It is necessary for the men to report at the office in the mornings to receive instructions and material, also to spend time travelling to and from the jobs; but the time is, nevertheless, unproductive in the sense that it affects the total productivity of the workman.

The exact amount of unproductive time (stores and walking) before the commencement of the job voucher system was unknown, because we had no record under the old system; but it is known that the time spent by the fitters and their mates in the stores in the mornings averaged roughly an hour each. I give this figure unblushingly, because I believe an hour is quite the average time in many undertakings.

The walking time under the old order was unknown, because we followed the common practice of allowing the fitters to hide the walking time in the job time, which was usually given in hours. Under the new system the fitters are only concerned with working time, because the work summary is arranged so that the fitters enter the arrival and departure time for each job, from which the walking and stores times are calculated by the office and apportioned to the various jobs.

The total walking and stores time and the number of calls made are entered on a sheet called the analysis of unproductive time. These are sent periodically to the "B.C.G.A.," where a summary is made and returned, together with the summaries of other undertakings for comparison. The analysis of unproductive time for the month of October shows a great improvement in many respects, yet it is clear that effort must be concentrated in one or two directions in order to bring about more satisfactory results. Our total unproductive time per man per day has been reduced from 85 to 74 minutes while the system has been in operation. This has been effected mainly on stores times, which show a decrease from 14 minutes to 3 minutes per day per man. An average of 3 minutes may seem unusually small; but I assure you it is correct. It is highly creditable to the foreman and the fitters in that they are equally keen upon the reduction of unproductive time, because they realize that excessive fixing charges retard sales of apparatus upon which their employment depends. A small reduction has been made in total walking time. This has been brought about by a more careful selection of the route.

Another important improvement is in the number of jobs per man per day. The first analysis showed 2·8 jobs; while the analysis to October shows 4·2. Although this is decidedly better, we do not feel it reaches high-water mark. Improvement is being made by careful investigation into the condition and suitability of the tools carried by the men, as this factor has considerable bearing on their productivity. It is important to note that these results have been effected without rushing or sweating the men. We give them every opportunity to reduce their stores, walking, and job times, before we commence to speed up individual men, and even then we endeavour to help and train them, rather than to adopt the unscientific method of applying the whip.

These statements may be very interesting; but the important question is: "By what has the undertaking benefited?" The answer is as follows: (*a*) Unproductive time has been reduced; (*b*) fitters' productivity increased; and (*c*) fixing charges have been lowered considerably. I am convinced that a complete re-organization which enables fixing costs to be reduced is a distinct advantage to the makers of appliances; and this special service which the "B.C.G.A." is giving should have the full support and assistance of manufacturers.

The various makers are keen to assist in the development of sales; but it is impossible to develop the sale of appliances if fixing costs are prohibitive. The majority of appliances sold, either outright or by hire purchase, must be fixed; and innumerable cases are known where orders have been cancelled because of the excessive amount required for fixing. Therefore, however easy it may be for a maker to sell gas appliances, the undertaking has the control of the sale in the charges for fixing.

Another important item, both from the undertaking's point of view and also from that of the consumer, is the question of material used on the job. At Stafford, we have a simple, yet efficient, stores record system which is an integral part of the "B.C.G.A." job voucher system. The requisitions on stores are made by means of the vouchers, which ensures that all material used on the job, and only that material, is charged on the job.

The stove and meter shops have been brought under the general scheme, both regarding clerical system and labour. Considerable improvements have been made in output of renovated cookers, and statistics are available showing substantially reduced costs.

SOME ADVANTAGES OF THE NEW SYSTEM.

I herewith summarize a few of the many advantages which have accrued since the system has been introduced:

(1) Cost and history of each particular job.
(2) Check upon the productivity of each particular man.
(3) Minimum unproductive time.
(4) Check upon complaints and orders being unsatisfactorily carried through.
(5) Minimum amount of supervision required.
(6) Minimum amount of clerical work for outdoor staff.
(7) Reduced fixing charges.
(8) Check upon stores stock.
(9) Elimination of stock taking.
(10) Reduced clerical work by office staff.
(11) Reliable statistics classified, to which reference may easily be made.
(12) Accurate profit or loss on each job shown.
(13) Working cost of distribution department available at any time.
(14) Reduction of staff.

Considerably more work is being accomplished by a staff of 30 than was done hitherto by 42 men. The financial effect of the re organization, after taking into account the automatic wage reductions, shows a saving on labour cost of £1380 for the year ended March last.

In conclusion, I wish to acknowledge my hearty thanks and indebtedness to the staff of the "B.C.G.A." for the admirable and exceedingly tactful methods adopted when dealing with the workmen in putting the scheme into operation.

DISCUSSION.

The PRESIDENT expressed indebtedness to Mr. Poulson for his contribution. It was most interesting; and the economies that had been effected suggested that the question might be worth considering with a view to the application of the whole or part of the system to their own works.

Mr. C. H. CARDER (Oldbury) stated that he had adopted many of the methods, and mentioned that he was able in his works to have a daily stock balance. The drastic reforms made by Mr. Poulson indicated, if anything, that the undertaking had not been as progressive in administration as it might have been.

Mr. J. PATERSON (Cheltenham) said that his experience at Cheltenham, where the system was adopted, coincided in many respects with that of Mr. Poulson. They got similar advantages. In some respects better; in others perhaps not so good. In regard to casual labour much economy was effected, better work was secured from the men, and the working of the job voucher system ensured close control of the men on the district. As a result of the system, they were now able to say what was the cost of their varied operations in the district. Without proper and careful costing it was impossible to tell what the different departments were costing. The analysis system enabled them to say what they were not doing, as well as what they were doing. The "B.C.G.A." gave them great assistance by sending them copies of the analyses of different undertakings which were working under the system. They were thus able to pick out the best, and to make an effort to emulate them. A man was placed in the position of knowing precisely what his stock was—the total stock and the works stock. He had been able to reduce the amount of stores held by 33 p.ct. Another advantage was that the job voucher system was elastic.

Mr. G. HELPS (Nuneaton) inquired if profits were shown on various parts of work that was being carried out.

Mr. W. M. MASON ("B.C.G.A.") stated that experience showed that savings similar to those effected at Stafford were obtained at many undertakings. There were some considerable difficulties about the earlier working of this department. But the main difficulty had been removed; and it was now easy to cope with the work that came in. Such statements as to economies effected came from departments which were not inefficiently managed.

Mr. POULSON, in reply, pointed out that the personnel of the working staff was greatly affected by the war, many men joining the services. He agreed with Mr. Paterson that comparative figures in regard to other undertakings were very valuable. Regarding Mr. Helps' question, they made losses on stoves and meters; complaints were dealt with at a little less than cost; while on new work they endeavoured to make a profit.

The vote of thanks was unanimously passed.

SALESMEN'S CONFERENCES.

Mr. W. M. MASON drew attention to the importance of salesmen's conferences. The suggestion had been made that a series of meetings or conferences should be held in the Midlands, in order that salesmen who were concerned with the sale of gas in any form might discuss the many problems that arose, and generally exchange views. Such meetings had proved very successful in the North, in Wales, and in several other districts; and the hope was entertained that the co-operation of the senior members in the industry would be given to the movement. These meetings, while primarily for salesmen and others in a kindred capacity, were, of course, open to gas engineers; but experience showed that the presence of too many seniors did not tend

to a free and full discussion. Salesmanship was as important—if not more important than—as engineering.

Mr. H. POOLEY (Leicester) pointed out that the "B.C.G.A." had had this matter under consideration for a long time; and the idea of salesmen's conferences was recommended. He moved a resolution that a preliminary meeting be held in Birmingham at an early date to discuss the question of the inauguration of salesmen's conferences in Birmingham.

Mr. R. G. ROGERS (Birmingham), in seconding, said there was great need of salesmen in the Birmingham district, and he felt certain that those managers present would give their benediction and support to the movement. The information and guidance that the salesmen would obtain from such conferences would, he was sure, prove a paying investment for the small outlay that would be involved by their attendance. As far as Birmingham was concerned, he believed full support would be forthcoming. It was necessary that sales problems should be brought down to the salesmen themselves. The conferences were a success in other parts of the country.

Mr. R. S. RAMSDEN (Leamington) agreed that close co-operation on the engineering and commercial sides was essential. It appeared to him that difficulties might arise owing possibly to lack of appreciation by the engineers of the importance of some of the suggestions that were brought by the salesmen from these conferences. Again, how were the expenses involved in the attendances of salesmen at the conferences to be met?

Mr. MASON, in reply, repeated that the attendance of seniors at these conferences did not conduce to free discussion. It was their sympathy and co-operation that was chiefly needed. As to the expenses, he did not think this would present much difficulty if the question were looked at as a business proposition. In Wales third-class fares and 5s. expenses were usually allowed.

The resolution was carried.

DISTRICT CONFERENCES.

Mr. MASON also urged the advisability of holding another district conference in the Midlands (similar to the one held at Coventry) in the spring; and a resolution was moved by Mr. PATERSON in favour of such a meeting being arranged. This was seconded by the PRESIDENT and approved. The latter offered congratulations to Mr. Paterson upon his appointment as a Vice-President of the Institution of Gas Engineers.

MIDLAND JUNIOR GAS ASSOCIATION.

A general meeting of the Midland Junior Gas Association was held on Thursday, at the Birmingham Council House. There was a much larger attendance than usual. The President, Mr. C. F. W. Rendle, occupied the chair, and accorded a welcome to Mr. W. M. Mason, of the British Commercial Gas Association, and to Mr. R. J. Rogers.

Mr. G. M. LEWIS, Showroom Manager of the City of Birmingham Gas Department, read the following paper on

SHOWROOM AND SERVICE.

I do not claim to be able to put before you any new ideas with regard to showrooms, but desire to call back to your memory points which have been touched upon many times recently, but which are perhaps too readily overlooked, and which I consider important from the point of view of the salesman and distributor of gas. I shall not make any mention of industrial heating, which in Birmingham is a department in itself.

THE SHOWROOM.

I will put as concisely as possible the requirements of a showroom, which will carry out the double purpose of a showroom and a lasting and prominent advertisement of the product in which we deal. There appear to be widely divergent views obtaining as to exactly what is required. In some of the latest efforts, the showroom element seems to stand first and foremost in the mind of the designer and architect. This cannot be the idea of the progressive manager, who must have a salesroom where he can dispose of all classes of apparatus; his object being increased business at the end of each financial year, and a correspondingly increased number of and improvements in the apparatus in his district. Committees and directors judge the advantages accruing from a department by the business done, and have no sympathy with "white elephant" schemes. Is it not reasonable to suppose that the more apparatus sold or issued on hire, the greater advertisement and consequent larger output would be obtained for the undertaking?

A certain amount of daring may be necessary at first in opening-out on a scale sufficiently large and attractive to catch the business dormant in the district to be served; but with the right enthusiasm in evidence, the risk will be well repaid. The premises chosen should be in the busiest and best shopping thoroughfare, with ample window frontage and sufficient space within to accommodate a range of all apparatus likely to be used in the locality covered. The interior should be well furnished, without elaboration. Costly furniture and panelled walls only lead prospective buyers to suppose that the prices charged bear some relation to the expense entailed.

MODEL ROOMS.

To my mind, model rooms and compartments are expensive luxuries usually occupying a large amount of floor space, and, though they lend themselves admirably to a general show of furnishing, are much too costly for showing the few special gas-fittings which can be satisfactorily displayed. One reads so often in the Technical Press of showrooms replete with extravagantly fitted model rooms, where fires and other apparatus are fixed in elaborate surroundings, where the fittings are few and only suitable for the exact style of decoration with which they are shown, and where they are most probably overlooked by the person they are intended to interest; of so-called practical kitchens built expressly to display a cooker or water heater which is, in cost, far above the outlay the average customer in the district is capable of; and of other apartments showing apparatus which, though desirable in a few instances, is far more suitable for exhibitions than for the design of house usually met with. Should it not be remembered, when displaying or recommending our wares, that in the great majority of cases they are purchased by customers who live in houses of much the same style as ourselves, and who have their own individual tastes to satisfy?

SHOWROOM DISPLAY.

It will be found that the majority of our patrons who do the purchasing are ladies, accompanied by the sterner sex; and it is proverbial that they expect a large selection from which to choose. This is especially so with those appliances where it is essential that style of decoration and colouring should be taken into consideration. In giving plenty of choice, the stock must not be overcrowded, but should be arranged so that the design and merit of each single item can be properly displayed and appreciated. It is a mistake to think that only inexpensive fittings are required; there is business to be done in really good and well-designed pendants and brackets. Silk shades in wide variety should also be stocked. For this purpose dustproof cases are a necessity, to obviate the shop-soiled stock one so often sees exhibited.

In a busy showroom, it is fatal to have too many fixtures connected with gas. Much deterioration, and consequent expense, is incurred owing to discoloration, if a large number are being continually lighted—not only to the actual fitting used, but by the products of combustion in the surrounding atmosphere. It will be found sufficient to have good general lighting and convenient burners on which to show shades and globes in use. In our central showroom there is a constant display of 150 lighting fittings, 75 fires, and 50 forms of apparatus for kitchen use, all different in some respect. None of these is allowed to remain long enough to lose its freshness—a trouble which is sure to occur in time in manufacturing districts, where the atmosphere is charged with smoke and other impurities. It should be the endeavour to have on view a selection of all apparatus designed for the use of gas. One is almost led to imagine, when visiting many gas showrooms, that the only aim is to sell lighting fittings, cookers, and fires in their entirety; and consumers must sometimes be perplexed as to where they can obtain the numerous other forms of apparatus which they need—irons, wash boilers, clothes airers, incinerators, grillers, kettle boilers, water heaters, indoor and outdoor shop lights, burners, &c.

SHOWROOM STOCK.

"Everything that uses gas" should be our slogan. Our consumers should know that, in all their many needs, they will get what they want from the gas department or company with courtesy and despatch—nothing should be too small or too trifling. Our service has broken down if only one of our customers cannot be fully catered for. I am aware that it is impossible to show all the different forms and designs of fitments put on the market by the many manufactnrers who seek our business. It remains, therefore, carefully to select only such as can be confidently recommended to do the work for which they are designed. With this in view, it is advisable to have a practical test made of new appliances whenever possible, before they are offered for sale; and it is surprising how many "snags" crop-up which do not become manifest in works tests.

As an instance of this, I may mention that our department have built-up a really good business in gas-irons—solely, I believe, by offering only reliable models. This is one of the lines which does good propaganda work, as we can give a more reliable, more economical, and more easily regulated article than competitors; and so long as we can supply the various implements in better form than can be obtained with other sources of heat and light, there is little inducement to our customers to go to the expense of dual supplies. Another speciality which stands high on our list of business done is the wash-boiler. The variety on the market is endless. We stock three patterns—the tinned copper, the enamelled iron, and the rustless—all perhaps equally good, and to be left to the personal choice or special need of the purchaser. Where the undertaking comes in is to see that the patterns offered are the best, as regards strength and construction, of what are available. Many of those offered are a menace to the trade. The metal is so light—both of the pot and the outer case—that, when one remembers they are heated by flame contact from a burner consuming about 40 c.ft. per hour, and that the products of combustion and condensation are a constant corroding factor, one can only expect trouble and annoyance following upon their installation.

THE BUYER.

A great deal is being said just now with regard to the need for improvement in our salesmanship, and it is all to the good; but is it not even more important that greater knowledge and technical skill should be brought into the actual buying side of the fittings departments? At present, with a few exceptions, the selecting of fittings is done by the engineer or manager of the undertaking, who is usually mainly concerned with the manufacturing

processes, and can have little experience as to the requirements of the districts, or of the technicalities of domestic apparatus. The point I wish to make, with regard to apparatus for re-sale, is that close co-operation or collaboration with the fittings salesman and/or superintendent is desirable, as they are the men actually concerned in the sale and fitting of apparatus, and can be best qualified to know what is required, and to judge of its correct construction and efficiency. There is much evidence that in the past these points have been overlooked, and great blame has been cast upon manufacturers because of the shoddy character of fittings and appliances. The remedy is in our hands. I estimate that 75 p.ct. of the fittings made in, and imported into, this country are sold by the makers or factors to gas undertakings for distribution to their consumers. The chief culprits have been the buyers for the automatic-meter fit-ups. It would appear that price was the only consideration; and a fitting that would remain gas-sound until the fitter left the job has been deemed perfectly satisfactory, without any question as to its strength or construction. This specially applies to pendants, brackets, and burners.

Inspection of Fittings.

I gather from the Technical Press that, owing to the number of accidents occurring to users of gas through leaks—a figure which is infinitesimal when compared with the potential number—some undertakings are advocating the periodical inspection of fittings. This is a policy much more easily suggested than satisfactorily carried out. After thirty years' technical experience, I should hesitate to decide, even after careful examination of a fitting *in situ*, whether it would last one year or ten—except so far as one might discover obvious errors in construction. The proposal bristles with difficulties. To detect a weakness in tube or casting would defy the most expert. In an atmosphere charged with metal-corroding acids, such as one has in manufacturing districts, the lacquer is soon destroyed, and the metal—especially where the quality is poor, as in the solder seams—is attacked; but a superficial discoloration such as one will find is far from sufficient to condemn the fitting. It is another matter when there are obvious reasons for changing—such as the old water-slide fittings, which should be condemned at sight.

Standard Fittings.

It has been suggested that fittings and apparatus of standard design are required; but a fixed standard of capacity, strength, and quality for all apparatus and installations, and for the department concerned to supply nothing unless it agrees with the specification, is the safer policy. In Birmingham we have had such standards for some time, with the result that very little trouble is experienced regarding apparatus supplied in recent years; but when one realizes the class of fitting which was fixed throughout the country during the first ten years of the automatic meter, and how the makers were compelled to cheapen their production to obtain orders from even the most wealthy companies, one wonders what policy to advise—whether it will not soon be time to suggest the gradual scrapping of the old installations, and re-fitting with good and up-to-date fixtures—especially as those which I have in mind were designed for the now obsolete flat-flame burner.

There is, I know, a movement afoot to obtain a legal standard of strength for all fittings and apparatus used for the purpose of conveying or holding gas in distribution to the consumer. This is very advisable; but these schemes take a long while to mature, and in the meantime it is up to us to manage our own affairs. If the buyer knows his business—and his knowledge should cover the actual processes of manufacture of the goods he buys—he will purchase only such as he can confidently guarantee. It will, of course, be understood that the fittings will cost more than those of the cheap and nasty variety; but it is found that a few coppers extra on the ordinary plain fittings make all the difference between a doubtful and a sound proposition. Does it not appear that the false economy, which has been so prevalent during the period through which our business has made its longest strides, is at the root of the great maintenance bogey?

Maintenance.

I hold that, providing all fittings and burners supplied are correct in construction, and are fitted by practical and competent workmen, there should be no need of periodical maintenance. It seems to me farcical, and a bad policy, to suggest to our customers that it is necessary to have a man from the gas department every six weeks or so to put new mantles on and to keep the lights in order. It should not be, and is not, necessary so far as domestic lighting is concerned.

The lighting of public buildings, large shops, and factories is another matter. Other conditions must be taken into consideration, and in most cases periodical examination is desirable; but maintenance attendants should be trained to discriminate, and only interfere with what obviously needs attention. One of the chief *desiderata* with regard to lighting installations is a thoroughly good burner and mantle; and I would again emphasize the necessity of buying only the best obtainable. Here, again, a practical test is the best safeguard. It is also advisable that special attention should be given to the design and quality of glass supplied. Free inspection of cookers, fires, and water heaters, whether on hire or the property of the consumer, should be offered; and everything possible should be done to encourage and increase business in this direction. Slight defects often occur which affect the full efficiency of the apparatus, owing to rust, condensation, or deposits of fat; and the seat of the trouble is not apparent to the layman, while easily found and rectified by the experienced.

One sometimes feels that the makers of apparatus are approaching the question of maintenance from the wrong direction. What we desire is to be in a position to supply goods which will not go wrong; their aim seems to be to show how easily they can be put right. An illustration of a bathroom floor covered with pieces of a water heater, or a hearth littered with parts of a gas-fire, does not appeal to me as good propaganda. The point I desire to make and emphasize is that, while maintenance is an important branch of our service, it must not be overdone.

Salesmen's Conferences.

Salesmen's conferences are a very excellent means of improving the qualifications of the distributing departments; and it is to be hoped the advantages, when offered, will be open to the right men of all undertakings. There is little profit to the industry in improving the processes of manufacture, and the quality of gas, unless economical and efficient apparatus also is increasingly supplied to create the demand; and with this end in view, engineers and managers should give as many opportunities as possible for their technical staff to obtain the necessary knowledge and experience, by seeing and learning what is being done in other centres, and by visits to works where they can gain some idea as to the construction of the apparatus they are supplying. Knowledge begets self-confidence—without self-confidence one cannot become a salesman. There are people who will pay any price for luxuries; but for the household one usually meets with, we still hold our own. There are more lighting fittings being sent out than ever, and the business in cookers, fires, and water heaters shows no sign of a decline. Twenty-five years ago the incandescent burner put us well on our feet; ten years later the inverted burner gave us another impetus; and I have no doubt that there is some "gland" in preparation that will give us a fresh lease of life, if (and when) we feel our energies flagging. In the meantime, the business must be approached and carried through with enthusiasm.

Departmental Co-operation.

It will be understood that the policy I am advocating cannot be carried through as a one-man show. There must be close co-operation and support among all members of the fittings staff. Most of us have our pet theories as to the merits or disadvantages of various apparatus. These can be argued among ourselves; but to the public a united front must be exhibited. For this purpose, staff meetings and discussions, where the policy of the department can be defined, should be arranged.

A valuable means of encouraging support is for the buying department to issue periodically a price list of all the running lines used in connection with fittings distribution, and for it to be understood that a stock of all the items in the list will be maintained in the stores. By this means the district salesmen and canvassers will sell from the list, as they will be able to give prices on the spot, and can expect to have the goods without delay. In our department the list is almost as complete as possible, containing over 800 items. To meet the fluctuation in prices, it is published quarterly, on typewritten and copied sheets. In like manner a list of the types of gas-fires in stock is also given periodically. As you know, the number of patterns issued by makers is now so large that, unless something of the kind is done, one would be daily ordering odd stoves and awaiting deliveries.

I cannot emphasize too much the advantages gained by limiting the number of patterns of apparatus stocked. There are so many designs of fittings, burners, fires, &c., to be obtained that the whole department becomes chaotic unless there is some understanding as to exactly what one can expect to have from stock.

The buying and selling of "everything that uses gas" is showroom work, and our service to our customers is in proportion to the efficiency of that department. It would appear that managers of gas undertakings are not yet quite satisfied that a good showroom is a sound proposition. Ours in Birmingham does not in some respects fulfil all requirements; but there is no doubt that it meets with a good measure of support from the gas-consuming public.

A Word to the Makers.

May I mention, in conclusion, one or two instances where we should welcome the co-operation of the makers of apparatus? Presumably improved types of appliances are offered to us almost daily—such as cookers, kettle boilers, and gas-irons, fitted with gas and air adjustments, and other weird contrivances for improving flame formation. These are mostly for the use of female members of the community. What happens? I am at a loss what to say. A strong tally, with simple printed directions, should be sent out with each apparatus. I offer the suggestion as a remedy; but the most satisfactory boiler I know has no gas or air adjustment, and is the same as we have been selling for the last twenty years.

With regard to metallic flexible tubing (a necessary evil), the makers of apparatus are, with a few exceptions, fitting shut-off cocks with flexible nozzles on radiators, and table and floor standards. This is a serious danger. The tap should be fitted on the fixture at the other end of the tube, so that it cannot be left full of gas when not in use. Again, the remedy is in our hands. Notwithstanding the outcry from some quarters against the cheaper forms of radiators, there is a demand for these appliances, which must be met. Our part is to advise them only

where there are real reasons operating against the use of a fixed fire; and in this, as in all other disputable practices, we must only be influenced by our combined experience.

DISCUSSION.

The PRESIDENT remarked that a good showroom was a sound proposition for any gas undertaking; and he would welcome any movement for applying standards of strength for fittings.

A vote of thanks to Mr. Lewis was moved by Mr. H. CLARKE (Derby), who suggested that gas undertakings without a showroom were like a room the blinds of which were drawn.

Mr. R. G. ROGERS (Past-President), in seconding the resolution, said he regretted that shoddy fittings were sold by many undertakings, and held that the gas manager was often responsible. It was not a sufficient excuse to say that there was a demand for them. The plain fact was that if the manager did not buy them, the manufacturer would not make them. He thought that on the whole gas engineers' salesmen and showroom managers were becoming more enlightened, and were not buying "cheap and nasty" material—as was bought years ago. Their position in the future would be determined in proportion to the extent to which this policy was carried out. Unless more care was taken by buyers, there would be continuing trouble with consumers. Too much emphasis could not be laid upon this point. Reference was made by Mr. Lewis to the fact that gas managers did not attach sufficient importance to the question of the type of apparatus displayed in their showrooms. It frequently happened that a gas manager, with his many other duties, had not adequate time to devote to the sales side of the business, and in the selection and display of goods. Much more could be done to ensure that only the most efficient appliances were purchased. Great improvements had been made during the past few years in connection with lighting fixtures, which reduced materially the number of visits necessary to premises to adjust lighting burners. He attached importance to the proposal to hold a salesmen's conference, to be devoted wholly to questions of salesmanship. It frequently happened that at the ordinary meetings of gas engineers, senior or junior, other considerations cropped up which prevented full attention being given to this and kindred matters. He hoped salesmen's conferences would be held in the Midlands.

Mr. W. M. MASON, of the British Commercial Gas Association, strongly urged the importance of the holding of meetings in the districts for the discussion of subjects cognate to the selling side of gas; and he mentioned that on the afternoon of that day he had pleaded at a meeting of the Midland Association of Gas Engineers for their co-operation in this movement. He was hopeful that it would be possible to hold in Birmingham a meeting on Wednesday, Nov. 29. The idea of these conferences was to stimulate ideas, and to enable the salesmen to profit by the views of others. Immense advantage was to be obtained from free discussions. A showroom should be a showroom in a real sense—it should be educational. It should serve an effective propaganda purpose; and the results could not be gauged immediately. A showroom was necessary if there were no sales at all; the chief aim being to create and raise public opinion respecting gas, and the use of the various appliances. It was most important that the entrance to a showroom should be made thoroughly attractive in appearance; while in the room itself everything should be suggestive of cleanliness and brightness. The fittings should be only those which were modern; no broken fuel should be on view; the tickets should be bright and clean; and the place should be adequately ventilated. General smartness was, in fact, essential.

Mr. POULSON (Stafford) expressed the hope that cheap fittings would soon become things of the past. He believed gas engineers generally would do all they could to encourage smart-looking showrooms.

Mr. R. G. MARSH (Birmingham) congratulated Mr. Lewis on the boldness with which he had dealt with his subject. His view, in spite of his criticism of the model showrooms, was that such a room, arranged on sane lines, did much to attract business. It was obviously a matter of discretion as to the manner in which model showrooms were used.

Mr. SIMMONS (Dudley) spoke of the value of a showroom on the educational side. In dealing with complaints, he insisted that it was of the first importance that capable, intelligent men should be sent to do repair work. Their function should also be to reassure gas users in regard to apparatus, and to give hints in reference to its use.

Mr. WHITEHEAD (Birmingham) urged the necessity of maintenance men being properly qualified; otherwise they were no good to the industry. Salesmen should have some knowledge of building construction.

Mr. BURDEN (Redditch) emphasized the necessity of salesmen having knowledge of conditions on the district, in order to ensure the suitability of apparatus recommended in the showroom. Every appliance should be priced in plain figures. The advertising effects of the "B.C.G.A." should be backed-up by local newspaper publicity.

Mr. W. F. FLETCHER (Birmingham), speaking of the showroom staff, pointed out that the educative value of showrooms must be backed by thorough knowledge on the part of the salesmen.

The vote of thanks was carried with enthusiasm.

Mr. LEWIS briefly replied to the discussion. His argument as to model rooms was more particularly applicable to the smaller undertakings, where they could not afford the space. By model rooms he was referring to rooms expensively and completely fitted. He disagreed with the idea of a combined office and showroom.

Congratulations and good wishes were sent to Mr. J. B. J. Bell on his appointment as first secretary of the newly-formed Junior Association in South Wales.

Books Received.—We have to acknowledge the receipt from Messrs. Benn Bros., Ltd., of No. 8, Bouverie Street, E.C., of the first three volumes of a new series of books, which an early opportunity will be taken of reviewing. The titles and authors are: "Modern Gas-Works Chemistry," by Dr. Geoffrey Weyman; "The Administration and Finance of Gas Undertakings, with Special Reference to the Gas Regulation Act, 1920," by Mr. George Evetts; and "Gas-Works Recorders," by Dr. Leonard Levy.

SCOTTISH JUNIOR GAS ASSOCIATION.

Joint Meeting of the Eastern and Western Districts.

The first of a series of joint meetings arranged between the Eastern and Western Districts of the Scottish Junior Gas Association was held on Saturday last, in Fairley's Restaurant, Leith Street, Edinburgh. Mr. W. DEARDEN, of Dunfermline, who is the President of the Eastern District, occupied the chair, and the attendance was encouraging.

The CHAIRMAN, on behalf of the Eastern District, most cordially welcomed the Western Juniors to Edinburgh. He was glad that the new departure from past arrangements—it was a novelty to have a joint meeting—had opened auspiciously from the point of view of attendance.

Mr. W. J. LENNOX (Falkirk), the President of the Western District, said it was a pleasure to him to reflect that the Eastern and Western Districts had got together and had arranged joint meetings. Nowadays many young men were entering the gas profession in different parts of Scotland, and it would be really beneficial to all if they could have social intercourse with each other and discuss problems of mutual interest in their workaday pursuits.

The CHAIRMAN then introduced Mr. George Laurie, of Alloa, who read the following paper on

PROBLEMS OF CONDENSATION.

The condensation of coal gas has received considerable attention from time to time, and different opinions are held as to the best method of obtaining the desired effect. There does not appear to be any conclusive evidence that any one type of plant has decided advantages over all the others. Probably the most common method is to cool the gas to the required temperature (atmospheric) in one vessel. The other method is to cool it slowly in a long foul main, and then by degrees bring it to the desired temperature through a series of condensers. It has been proved by experience that rapid or sudden, as well as excessive, condensation is to be avoided in order to prevent the deposition of the hydro-carbons from the gas; so that it would appear that the latter method is more satisfactory. The gas from the hydraulic main should be carried in a foul main until it falls to about 100° Fahr. before it enters the condensing vessel. In this way the gas is gradually reduced in temperature, and at the same time retains most of the valuable constituents in the permanent state which would otherwise have been condensed in a more rapid drop in temperature.

NAPHTHALENE DEPOSITION.

It would perhaps not be out of place to refer to the deposition of naphthalene. Gas at a high temperature will hold in suspension more naphthalene than gas at a low temperature. Therefore, if gas is not reduced to the temperature at which naphthalene will be likely to fall in the mains and services, then the excess of naphthalene held in the gas will be deposited in these mains and services; so that it would seem advantageous to keep the gas in the works at the same temperature as that which prevails in the district of supply. The temperature of the gas in the mains is about 49° Fahr.; this figure representing the average of temperature observations for the several months of a complete year. To reduce the temperature to this degree in the works is not possible, as the gas has to be at least 60° Fahr. to ensure a good reaction in the purifiers. It is quite usual for the gas to be cooled considerably below 60° Fahr. at the condensers, and then increased to over 60° Fahr. for effective reaction in the purifiers. In this way most of the naphthalene is deposited in the condensing vessel; the gas being again raised in temperature to go through the purifiers at about 60° to 65° Fahr.

TYPES OF CONDENSING PLANT.

Of the various types of condensing plant, the following is a short description. First, we have the atmospheric, which may be divided into three—viz., the ordinary pipe atmospheric, the annular, and the battery condensers. The first two types are well known, and need not be described. The third type is not so familiar, and is seldom to be seen in gas-works, probably due to its high cost of manufacture. A brief account of it, therefore, may not be out of place. It is rectangular in shape, of cast iron, usually about 2 ft. wide, and 15 or 16 ft. in height; the length being made suitable to the capacity of the works. Internally it is divided into spaces 2 ft. apart, the divisions extending to within a few inches of the top and bottom alternately. The efficiency of the plant is augmented by small transverse tubes 2 in. in diameter, through which the atmosphere is free to circulate. These tubes serve the double purpose of cooling the gas and breaking it up in its travel and retarding its progress, inducing a natural settlement of the light tars. This is an excellent apparatus, and perhaps the most efficient of the atmospheric type; but it has the disadvantage that the outlet temperature cannot be controlled. Of course, this could easily be done by fitting sliding shutters to the ends of the transverse tubes, and regulating the amount of air required to keep the outlet gas temperature constant.

For atmospheric condensers, at least 10 super. ft. of actual condensing surface must be allowed for every 1000 c.ft. of gas made per day, this to be calculated at peak load and for cast iron. With condensers made of steel, 6 super. ft. per 1000 c.ft. per diem is ample. This includes for length of foul main between retort-house and condenser. It has been assumed in the capacities given that one-half of the area required is in the foul main. Should

the foul main not provide this proportion, a corresponding increase must be allowed for in the condenser capacity.

Now to sum-up the advantages and disadvantages of the atmospheric type. Undoubtedly the great advantage of the type is its extremely low maintenance cost, specially if constructed entirely of cast iron. It needs practically no attention; only a coat of paint at long intervals of time. Its disadvantages are numerous. The first cost is comparatively high; so great a surface is necessary where a large capacity is required. Then, again, in growing works where space is limited, these condensers take up considerable space, and often room cannot be found for them in the proper place. Lastly, but most important of all, they cannot be controlled to any appreciable extent.

We will now turn attention to water-cooled condensers. The usual type consists of a cast-iron tower, either square or circular in plan, having a bottom water-chamber, gas-chamber, and top water-chamber. Running through the middle of the gas-chamber are the water tubes. These are usually screwed into the partition of the bottom water compartment, and locked on the under side by jamb nuts. At the top partition the tubes pass through stuffing boxes, which allow for the difference in expansion of iron and steel. The inlet gas connection is placed at the top of the gas-chamber, and the outlet a few inches from the bottom, to ensure that the condensate does not flow down the foul main. The water flows in at the bottom, and overflows at the top. In this way, the hot gas from the retorts comes first into contact with the water at the top of the tower, the water at this point reaching as high a temperature as 170° Fahr. The gas travels down the tower to the bottom, where it is in contact with the cold water end of the tubes.

Cooling-Surface Area.

Now we come to the question of how much surface is required to cool (say) 1000 c.ft. of gas per day. This is a point on which there appears to be a lack of definite information. Of course, it is all a question of the number of gallons of water to be passed through the apparatus per 1000 c.ft. of gas cooled. It is fairly evident that the more water passed through the tubes, the larger the volume of gas that can be treated, or the bigger reduction in temperature. It is also clear that a smaller surface area will be required to cool the same volume of gas. The question then arises as to the water supply—whether it can be obtained on the site by pumping from a well, or whether one has to resort to the town supply. In the latter case, the water consumption has to be cut down as low as possible for reasons of costs. It is highly important that the water employed be free from sediment and other injurious ingredients, so as to prevent the tubes silting-up and being eaten away.

At Alloa a year ago additional condensers were required. The specification called for a capacity of plant with area of condensing surface of a capacity of 750,000 c.ft. per day, the type to be water-tube. Examination of the tenders revealed the following information:

Tender No.	Cooling Surface.		
	Total Square Feet.	Per 1000 C.Ft. per Diem.	Price per Sup. Ft. of Cooling Surface.
		Sq. Ft.	s.
1	1800	2·40	7·77
2	2250	3·00	6·66
3	1638	2·18	10·43
4	2040	2·72	8·60
5	904	1·20	27·76

As will be seen from this table, in the several plants offered there is a wide variation of cooling surface per 1000 c.ft.—viz., from 1·20 to 3·00 sq. ft. After consideration of the comparatively high temperature of the foul gas from vertical retorts with full steaming in practice, and that we have to obtain our water supply from the town mains, we decided on a 3 sq. ft. per 1000 c.ft. plant. From experience we have had since, I would certainly not recommend anyone to put in a plant of this description with a surface capacity less than 3 sq. ft. per 1000 c.ft., and that this figure should be taken as a minimum. Indeed, this efficiency figure could be increased with advantage in the particular cases where steaming of vertical retorts is practised. It is well known that it is the aqueous vapour which accounts for the greater cooling surface needed.

One other point which I think is worthy of mention. This is the gauge of the water tubes. It is clear that these are subject to corrosion, and, once they start to leak, cause no end of trouble. In this connection it should be mentioned that the top water compartment must be kept full of water to prevent the atmosphere getting to the tubes. When going into this matter, we asked the manufacturers if they could arrange to put in 2 in. cast-iron pipes instead of the steel tubes; and while the difficulties were surmountable, the extra cost was not considered justifiable. We therefore concentrated on steel pipes, and put these in as thick as possible—viz., fully 3·16 in., which I think will last for a fair number of years, and will amply repay for their extra cost.

Position of Condensers.

At Alloa we have departed somewhat from the usual practice, in that the water-tube condenser has been placed close up to the retorts, and in close proximity to the boiler-house. The reason for this is to make use of the heat units in the gas to provide a high-temperature feed-water supply for the boilers. In this way, we get feed water at the check valves at anything from 135° to 150° Fahr. The gas entering the condensers varies considerably in temperature, from 130° to 190° Fahr. The temperature at the outlet is 80° to 90° Fahr. The remaining length of foul main and the old atmospheric condensers suffice to complete the cooling process. As for the amount of water used, the figure at Alloa is not applicable to a normal plant as, first, the amount is regulated to suit that required by the boilers; and, secondly, this plant is only part of the whole condensing capacity. From other plants of which I have knowledge, the amount is anything up to 3 gallons per 1000 c.ft. per diem.

Now to sum up the advantages of this type. First, the initial cost is much less than the atmospheric. The comparative costs for the two types (as in 1921) show the cost of water-cooled to be about one-half of the ordinary cast-iron pipe condensers. Second, the space occupied is comparatively small, owing to the fact that water is a more efficient cooling agent than air, as shown in the following table:

Excess of Temperature in the Gas.	Quantity of Heat Lost by a Square Unit of Exterior Pipe Surface.	
	When Radiating in Air.	When Radiating in Water.
For an excess of 10°	8	88
,, ,, 30°	29	5,353
,, ,, 50°	53	13,437

Thirdly, the water-cooled type shows greater adaptability to prevailing weather conditions, and is easily regulated to a wide variation in make of gas.

Practically the only disadvantage is the cost of providing an adequate water supply. This may be serious, specially if the heated water is not put to a practical use. The conditions obtaining at different works are so varying that it is hardly possible to give the gallonage of water necessary for proper condensation. It is undoubtedly true that under certain conditions the volume of water used may render the cost of condensation so high as to make the use of water-cooled condensers prohibitive. If costs were taken out, there may be cases where the expense for condensation by water-tube condensers is more than, for example, the costs of purification. Where steaming of vertical retorts is practised, and it is found that existing condensing plant is inadequate, then the introduction of the water-tube condenser as an auxiliary is to be recommended. Its adoption, however, can only be advised if the practice, as now outlined, is followed as regards position of the plant, and the use of the cooling water for boiler feed or other useful purpose.

A discussion took place, after which the author was warmly thanked for his interesting contribution.

The members afterwards had tea together and a very enjoyable social evening was spent.

Gas-Fire Lectures.

Two successful lantern lectures, arranged, one by the Portsea Island Gas Company, and the other by the Southampton Gas Light and Coke Company, were given recently to the employees of the respective Companies, and were very much appreciated. The subject was the hygienic principles of the modern gas-fire. The lecturer (Dr. Hartley, Chief Chemist of Radiation, Ltd.) dealt clearly with all the big advantages which are contributing to the amazing success of the modern gas-fire, and briefly outlined the course of the research work which had guided the firms constituting Radiation, Ltd., in their progress towards their present highly-efficient models. In particular, his demonstration of their latest patent gas-injector was of more than usual interest; its evidence of real engineering skill in fine production being very noticeable. The lecturer emphasized the great importance of the gas-injector, and pointed out that the one under discussion positively ensured a correctly-proportioned mixture of gas and air. It embodied separate adjustments, both for pressure and calorific value; the ranges of adjustment being from 350 to 600 B.Th.U. per c.ft., and 15-10ths to 70-10ths pressure. It was explained that this Radiation patent gas-injector shows a notable advance in having these adjustments entirely accessible. The tap is of special design, ensuring silent flames in any of its positions. The injector is out of sight under the fender; only the thumb-piece of the tap being visible.

Embezzlement Charge at Winchester.—For embezzling nearly £2000, the property of the Winchester Water and Gas Company, Arthur Frederick Small was sentenced at Hants Assizes to three years' penal servitude.

Tar Prices and Road Treatment.—While referring to the estimates at a meeting of the Wigtownshire County Council, Mr. Stair M'Harrie drew attention to the price of tar, and stated that unless a substantial reduction took place, the use of tar on the roads might have to be abandoned. At the present time the price was 8½d. per gallon; and as it required 10 gallons for every cubic yard of broken metal, its application for road work had become practically prohibitive. The price of coal did not warrant such a figure, and it seemed to him that road authorities, as a body, should make a strong representation to the Ministry of Transport on the subject. At the present figure, the cost of surfacing one mile of main road amounted to no less than £500 for tar alone.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Do We Know Where We Are?

SIR,—Referring to the communication signed by Mr. C. B. Tully in the "JOURNAL" of Nov. 15 [p. 442], I take it that the latter is intended to be an answer in the affirmative to the question at the head of it.

There may be a little doubt, however, in the minds of your readers as to whether the question is satisfactorily settled, after reading that portion of the last paragraph which says: "A therm in the gas should cost no more than a therm in the coke; and as this would make the cost of coke prohibitive at the present price of gas," &c.

It may be that the writer has some occult way of overcoming the costs of conversion which is not visible to the ordinary mind; but in the interest of those who wish to see clearly, a little explanation appears to be needed.

THOS. GLOVER.

British Gas Light Company, Ltd.,
Norwich, Nov. 16, 1922.

Yorkshire Junior Gas Association—Members' Travelling Expenses.

SIR,—Referring to your report of the annual meeting of the Yorkshire Junior Gas Association, I regret that an error has crept in in the case of Sheffield, and give below a correct statement of the authorities who pay expenses.

Corporations.	*Companies.*
Leeds.	Sheffield.
Bradford.	Elland.
Dewsbury.	Yeadon and Guisely.
Blackburn.	Calverley and Horsforth.
Ossett (half expenses paid).	Penistone.
	Harrogate.
	Wakefield.

Urban District Councils.

Silsden.
Cleckheaton (half expenses paid).

F. A. C. PYKETT, Hon. Secretary.

Gas-Works, Halifax,
Nov. 14, 1922.

REGISTER OF PATENTS.

Gas Analyzing Apparatus.—No. 162,249.

SVENSKA AKT. MONO, of Stockholm.

No. 11,359; April 19, 1921. Convention date, April 23, 1920.

Gas analyzing apparatus has hitherto been constructed in which two or more series of analyses are performed—one series for determining, for instance, the percentage of carbonic acid and the other series the percentage of carbon dioxide in a mixture of furnace gases. But it is, say the patentees, of great importance that the person observing such apparatus be capable without difficulty to read-off the result of the analysis; and according to the present invention the gas analyzing units are so constructed that at least one and the same constituent of the gas is included in all the analyses.

The advantages claimed to be obtained by the device constructed according to the invention consist chiefly in that, while using one and the same diagram, three readings may be effected as a result of a series of alternate records—for instance, one determination of the percentage of the carbon dioxide, one of the carbonic oxide, and one of the sum of both. Furthermore, the variations of the zero line in the diagram are entirely equalized, being included for both series of analyses to the same extent.

Manufacture of Carburetted Water Gas. No. 171,079.

FULLER-LEHIGH COMPANY, of Fullerton (Penn.), Assignees of G. H. KAEMMERLING, of Allentown (Penn.), and H. W. BENNER, of Bethelehem (Penn.).

No. 18,493; July 7, 1921. Convention date, Nov. 2, 1920.

The present invention relates to the manufacture of carburetted water gas—that is to say, water gas obtained by the passage of steam through incandescent fuel and enriched by fixation of volatile hydrocarbons introduced into the generator above the level of the body of incandescent fuel therein. The invention, briefly stated, consists in introducing into the water-gas generator, above the top surface of the fuel bed, powdered bituminous coal in suspension in a fluid-carrying medium during the steaming period, and distilling from this coal, while in suspension, gases for the carburetting of the water gas as it rises from the fuel bed.

In carrying the invention into effect, the generator, as in usual water-gas practice, is filled to the predetermined level with a bed of coke or anthracite coal, adapted to be brought to a condition of high incandescence by the admission of an air blast below the grate. At the beginning of the blow, the products of combustion are permitted to escape through an open flue leading from the top of the generator into the outer air. After the fuel bed has attained a sufficient temperature, a blast of secondary air is preferably admitted immediately above the upper surface of the fuel bed, thereby completing the combustion of the fuel gases as fully as possible, and storing the heat incident to such combustion in the refractory brick walls of the upper part of the generator, which are thus brought to a temperature appropriate to the subsequent distillation and fixing of the hydrocarbons contained in the powdered bituminous coal subsequently employed in the process. An appropriate temperature for this purpose is in the neighbourhood of 2000° Fahr.; and the blow is so regulated both below and above the fuel bed that the fuel will be brought to the proper temperature of production of water gas on the passage of steam therethrough, while at the same time the upper part of the generator is being brought up to the suitable predetermined distilling and fixing temperature.

In the succeeding steaming period, finely pulverized fuel is brought into suspension in the upper part of the generator above the level of the fuel bed. The carrying-medium employed for introducing the coal is preferably a gas (as, for instance, water gas); and the bituminous coal employed is ground to a fine powder, preferably so that 85 p.ct. thereof will pass through a 200 mesh screen. This, when borne into the generator by the gas current, will be suspended in the generator substantially in the form of a cloud of finely-divided particles which meet the uprising water gas resulting from the passage of the steam through the incandescent fuel. The suspended particles are immediately distilled, releasing their content of volatile hydrocarbons under the influence of the heat of the uprising water gas and the heat radiated from the highly incandescent brickwork of the upper part of the generator. Their distillation results in the formation of particles of coke, which apparently agglomerate and settle down progressively through the uprising water gas and on to the upper surface of the fuel bed. The normal level of the fuel bed is thus progressively renewed by the falling coke particles; and, in general, the amount of coke thus supplied is fully equal to all the demands of the succeeding blow period.

It has been found desirable to maintain a relatively low steam admission while the powdered bituminous coal is being admitted into the generator, in order that the uprising water gas shall have the minimum tendency to carry the particles into the exit flues of the generator, and in order that the coke formed may sink down with sufficient promptness and in equal distribution upon the top of the fuel bed. As soon as the temperature of the upper part of the generator falls below the temperature appropriate to the proper distillation and fixing of the hydrocarbons liberated from the distilled bituminous coal, the supply of coal is interrupted. Thereafter, if the temperature of the fuel bed is still sufficient for the economical production of water gas, the steam-blasting period is continued, preferably at a more rapid rate; the uncarburetted water gas thus produced being either conveyed to the same holder, or led off to a separate holder, or otherwise, for use as a fuel gas, and for supplying, under pressure, the relatively small amount of water gas for use in the introduction of the powdered coal into the generator.

A practical means for introducing the powdered coal into the generator consists in admitting it in a rapid succession of puffs. To effect this, the water gas is put under pressure of from 10 to 40 lbs. per sq. in. in a suitable receptacle, provided with a valved exit pipe leading into a receptacle containing the powdered coal; and the specification describes a form of puff injector for use to this end.

It has been found, say the patentees, that in the practice of the invention, a carburetted water gas may be produced having a high thermal and illuminating value, and that this value may be controlled within reasonable limits by varying the amount and richness of the pulverized bituminous coal employed; or if special conditions made it desirable, the gas may be further enriched with oil gas. A notable feature is the comparatively low production of tar.

Rims of Wire-Mesh Gas-Globes.—No. 186,977.

JONES, W., of Birmingham.

No. 18,151; July 5, 1921.

This invention relates to a globe in the form of a basin-shaped member constructed of fine wire mesh, the rim of which is permanently attached to a ring-like carrier during manufacture; the carrier mount being a rigid structure of metal and the part by which the globe is attached to the fitting. Such globes are extensively used, but present difficulties in packing for transport purposes, as they take up a considerable space, and need to be protected against each other from damage.

According to the invention, the rim of the basin is strengthened up by the permanent application thereto of a stout ring. The boundary of the mount to be engaged by this rim is shaped into a groove or seating into which the rim may be forced and be automatically gripped. The rim may have a snap action into the groove, or a number of pieces of the outer wall of the groove may be arranged for bending over the rim after the latter is in position.

The idea is easy attachment of the two parts; and in packing, the basin-shaped members can be placed one inside the other, as also can be the mounts.

Regulator for Gas-Burners.—No. 187,274.

REID, D., of Edinburgh.

No. 16,138; June 11, 1921.

This invention relates to a regulator for controlling the volume of flow or pressure of gas supplied to atmospheric burners for stoves, incandescent lighting, or the like, whereby, it is claimed, the intensity of the burner flame is improved and economy effected in the gas consumption.

The regulator is adapted to fit inside the gas supply pipe, and consists of a plug having peripheral grooves extending from end to end. Preferably the end of the plug directed towards the oncoming gas is tapered. It is located some distance in front of the burner or nipple (say, 3 to 4 in.) so that the gas enters a chamber between the plug and the nipple before mixing with the air, thereby effecting more intimate mixture with the air. The plug may for this purpose be fitted in an extension piece or tube in front of the nipple.

The plug may also have a central bore, or a plurality of longitudinal

perforations; and if desired, a revolving collar, sleeve, or equivalent means may be mounted on the plug, this collar being provided with notches or apertures which may be caused to register or not with the grooves and thereby control the passage of gas.

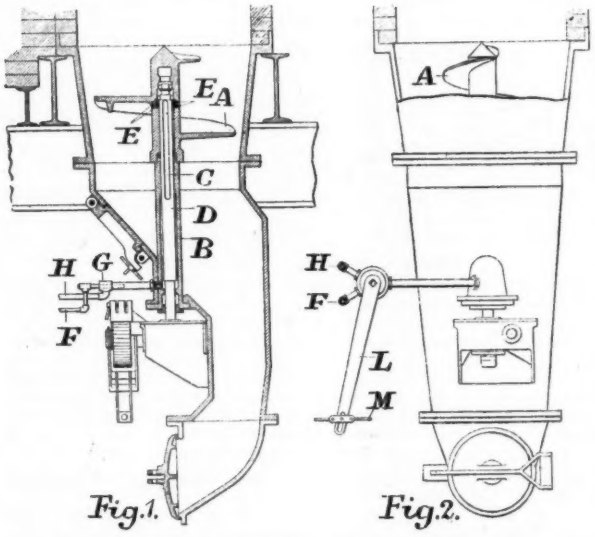
Destructive Distillation.—No. 187,263.

WEST, F. J., and WEST, F., both of Manchester, MADDEN, H. D., and BOARDMAN, F., of Cardiff, and WEST'S GAS IMPROVEMENT COMPANY, LTD., of Manchester.

No. 13,633; Feb. 10, 1922.

This invention relates to the destructive distillation of coal and like carbonaceous materials, and has for its object to provide improved means for obtaining an increased output of gas from, and throughput of coal in, the distillation plant without the necessity of increasing the heat applied to the exterior of the retorts in which distillation is effected. The improved means, according to the invention, relates to the method of simultaneous or alternate introduction, to the coke at the base of a continuous vertical retort, of steam and air in regulated quantities.

Fig. 1 is a sectional side elevation showing a portion of a vertical retort having the invention applied thereto, and arranged for a continuous steam and air supply by means of an injector; while fig. 2 is a front elevation showing the arrangement for the alternate admission of steam and air.



West's Gas and Air Injection System for Continuous Verticals.

Referring to fig. 1, the steam and air are led to the retort by way of the interior of the coke extractor worm A and the column B supporting same. A groove or channel as C is provided along the upper part of the worm shaft D; and holes as E through the barrel of the worm permit of the passage of the steam and air admitted at the lower end of the hollow drum B to the interior of the base or coke chamber of the retort. The steam is introduced from the supply pipe F by way of an injector at G, to which air is admitted by the tube H. From the mixing chamber I the steam and air together pass into the hollow column and thence to the interior of the retort.

The usual ratchet and other gear is arranged for the operation of the coke extractor worm; and the regulation of the steam and air admitted can be effected by suitable valves.

In the construction illustrated in fig. 2, the steam and air from pipes F and H are admitted alternately through a three-way cock which is preferably operated mechanically by a lever L to which an oscillatory movement is imparted by the reciprocating rod M which actuates the ratchet of the coke extractor gear.

The internal heating obtained by the admission of air to the coke chamber provides an efficient method of securing the high temperature necessary for the production of water gas from the injected steam; and the patentees claim, by the invention, to obtain increased gas yields, a diminution of scurf upon the retorts, an increased yield of ammonia, and an increased throughput of coal with economy in fuel consumption for the external heating of the retorts.

Differential Pressure Gauges.—No. 187,283.

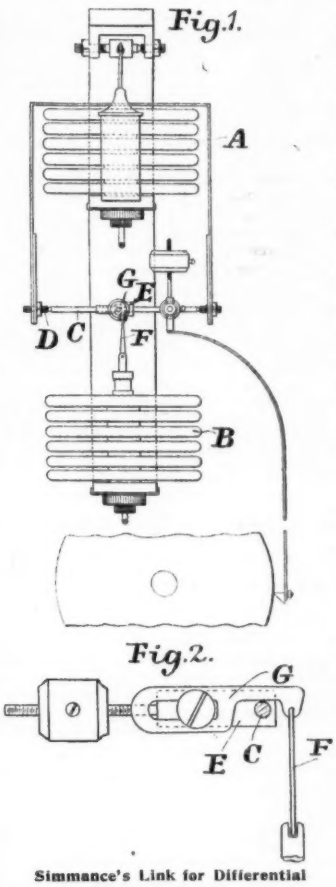
SIMMANCE, J. F., of Westminster Palace Gardens, S.W. 1.

No. 16,865; June 20, 1921.

This invention relates to pressure gauges of the well-known aneroid and Bourdon tube type, as applied to the measurement of the pressures of gases at above or below atmospheric pressure; and it has for its object to provide an improved construction thereof.

The invention more particularly relates to gauges comprising a pair of differentially acting elastic containers in which the portions of the two containers which are displaced under the action of the fluid under pressure supplied thereto are connected to the rotatable element of an indicating or recording mechanism by a system of linkage, so that equal increments in the pressure of the fluid supplied to the two containers cause equal and opposite angular displacements of the rotatable element; thus rendering the recording mechanism independent of variations in the absolute pressure of the fluid due, for instance, to changes in atmospheric temperature.

Fig. 1 is a view in side elevation of a gauge embodying the invention; and fig. 2 is a detail view on an enlarged scale of a portion of the mechanism.



Simmance's Link for Differential Pressure Gauges.

The containers A B are mounted one above the other in a suitable frame, the upper container being carried by a horizontal bracket projecting from the frame. The base of the lower container is mounted upon a similar bracket, the distance separating the brackets being, however, arranged to be adjustable within small limits. This adjustment is effected by pivotally mounting the lower bracket on the frame, and providing an adjustable set-screw, the rotation of which will tilt the lower bracket carrying with it the lower container.

Mounted upon the upper face of the container A is the horizontal arm of a metal stirrup, the two vertical arms of which project downwards on either side of the container to a point midway between the brackets. A horizontal spindle C is mounted in suitable bearings D attached to the lower ends of the arms of the stirrup, the spindle C being provided with a short projecting crank or arm E. A link F, pivotally connected at its lower end to the upper face of the container B, is connected at its upper end to a slotted plate G, which is adjustably secured to the crank E by means of a set-screw, as shown in fig. 2. The crank E is provided with an adjustable balance weight; and the spindle C at one side of the crank E is provided with a light pointer mounted as described in specification No. 13,749 of 1910.*

The upper horizontal arm of the stirrup is connected with a lever and an adjustable counter-weight, constituting the additional controlling force. The interior of each container is connected, by means of a suitable pipe of small internal bore, with the receptacles containing gas or other fluid, the differential pressure of which is to be recorded. For instance, in one application of the improved apparatus these receptacles are constituted by the hot and cold bulbs of a calorimeter, so that the apparatus will effect a continuous record of the difference of temperature obtaining between the two bulbs.

So long as the pressures obtaining in the containers are equal to one another, the horizontal spindle C carried by the stirrup will evidently not be rotated, since any increase of pressure in the upper container will raise the stirrup to an extent which is exactly equal to the extent to which the outer end of the crank or arm E of the spindle is raised by the same pressure acting upon the lower container. Any difference between the pressures obtaining in the two containers will, however, cause relative vertical movement between the stirrup and the crank E, with the result that the spindle C will be rotated and will cause a corresponding record of the difference to be effected by the pen mechanism.

The recording mechanism may conveniently be set to the desired zero position on the record sheet by adjusting the position of the lower bracket by means of the screw provided for this purpose.

* See "JOURNAL," Vol. CXIV., p. 540.

Continuous Drying of Neutral Ammonium Sulphate. No. 187,320.

MARR, J., and the COKE OVEN CONSTRUCTION COMPANY, LTD. (in liquidation), both of Sheffield.

No. 19,220; July 16, 1921.
No. 11,748; April 26, 1922.

This invention relates to the drying of granular materials by a process of the type wherein the material is continuously led by pneumatic and mechanical means through an enclosed conduit and exposed therein to a current of hot gas, and is characterized by these means of conveyance being caused to operate on the material independently at different sectors of the conduit; pneumatic action being employed for introducing the material into the conduit and for carrying it to and from the drying sector thereof, while transference of the solid through this sector is effected solely by mechanical means. Thereby the material is rapidly conveyed to and from the drying system, while contact with the drying agent may be appropriately prolonged, so as to secure the degree of drying desired.

Preferably the used hot gases and the dried product are withdrawn from the conduit system at separate points, for the purpose of avoiding loss of dried material and danger to the operator in removing the latter; while the means employed to convey the material through the drying section are advantageously such as to cause the solid repeatedly to pass through the current of hot gas. For example, the material may be subjected to a rotary progressive motion.

Where the material is of an acid nature, a neutralizing agent, in appropriate quantity according to the properties desired in the final product, may be added to the material within the conduit prior to its contact with the hot gas; the effect being more ready when the material is moist. The temperature within the conduit may be adjusted by varying the proportion of air, or other gas at normal temperature, admixed with the hot gases; the temperature being preferably the maximum possible which will not result in decomposition of the material undergoing treatment.

An apparatus suitable for carrying out the process comprises in combination a pneumatic induction-pipe, a drier fed thereby and of such diameter as to annul the suction effect on the material, mechanical means for conveying the material through the drier, and preferably adapted to bring the material therein into repeated contact with the gaseous drying medium, and a pneumatic outlet pipe for removing the dried material. Preferably a collecting chamber for the dried material is disposed at the delivery end of the pneumatic outlet pipe; the chamber being of such diameter that the suction effect on the material is annulled, while the gas passes forward. The pneumatic induction pipe to the drier may be flexible, and may be provided with a branch gas inlet near the intake end.

The apparatus is described in detail in the specification, in connection with a drawing; and the claims suggest treatment at a temperature not exceeding 80° C., and sufficiently slow to ensure complete liberation of the pyridine from the crude ammonium sulphate. A disintegrating device is incorporated within the drier.

Production of Smokeless Fuel and Coke.
No. 187,328.

ILLINGWORTH, S. R., of Radyr.

No. 19,355; July 18, 1921.

In specification No. 175,888* it has been shown that in order to get the best yield of oils (bye-products and ammonia) and at the same time dense hard fuels at temperatures not exceeding 600° C., the coal must be so treated as to eliminate certain of the less stable β cellulosic and resinic substances. By the reduction of the resinic content, on elimination of these substances of less stability a product is obtained the resinic matter in which is of a more homogeneous nature than in the original coal, and its thermal decomposition is associated with the minimum evolution of volatile matter.

According to the present invention, coal, which has a volatile content of 14 to 20 p.ct. at 900° C. and in which the major portion of the resinic matter decomposes around 350° and above 400° C, with the evolution of only a small quantity of volatile matter, is heated to a temperature not exceeding 600° C.; and thus a smokeless fuel is obtained. If desired, coke may be produced by heating this fuel to a temperature above 600° C.—say, to 900°, if metallurgical coke is required.

When coal of such low volatile content is carbonized in ordinary ovens at 900° to 1000° C., there is only a small yield of bye-products—say, 6 to 8 gallons per ton. On the other hand, when such coal is carbonized first at a temperature not exceeding 600° C. to form a coke structure, and subsequently at 900° or thereabouts, the primary products evolved from the β cellulosic and resinic compounds undergo little change. Consequently the yield of liquid hydrocarbons, &c., is greater, amounting in general to an increase of 150 to 200 p.ct. over the amount produced by carbonization at 900° C. Thus the process enables this type of coal to be used for coke production on an economic basis.

It has also been found, says the patentee, that some coals which contain 12 to 14 p.ct. volatile on an ash-free dry basis at 900° C., and which have a coking index of 4 or more may be converted economically into smokeless fuel by heating to a temperature not exceeding 600° C. When the coking index is as low as 4, the coal must be arranged in thin layers of 2 to 3 in. If thicker charges are to be used, such coals should be blended with others so as to bring the coking index as high as 6. (The index referred to is described in "The Analysis of Coal and its Bye-Products," published in 1921 by the Colliery Guardian Co., Ltd.)

* Patent of Addition to No. 164,104 of Feb. 28, 1920. See "JOURNAL" for April 12, p. 103.

Primitiva Gas Company of Buenos Aires.—In his market notes in last Monday's "Financial Times," some remarks were made by "Autolycus" on the position of the Primitiva Gas Company of Buenos Aires. He said: Coal stood at famine prices in the Argentine Republic during the war. The Primitiva Gas Company of Buenos Aires, for instance, paid between £8 and £9 per ton at one time, and even at this price were unable to obtain all that they required, having therefore to burn wood, grain, or anything else that produced gas. A firm of fellow-members writes to me pointing out that the Company have now entered upon the twenty-year contract for delivery of coal, which at present is costing them no more than 37s. per ton, delivered in Buenos Aires. No dividends have been paid on the £5 preference shares since January, 1916, so there is something like 35s. dividend in arrears. The Company showed a debit balance of £462,000 in the report to Dec. 31 last, up to which date the benefit derivable from cheaper coal had not come into the accounts. These preference shares stand at about £2¼, and while bearing in mind the fact of the heavy debit balance already mentioned, the speculative investor may reasonably assume that there is a very fair sporting chance for improvement in the future.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" regarding applications to the Board of Trade for Orders under the Gas Regulation Act.

SPECIAL ORDER.

Torquay Gas Company.

The Company give notice of their intention to apply to the Board of Trade for a Special Order under section 10, to sanction amalgamation with the Paignton Gas Company, to change the name to the Torquay and Paignton Gas Company, to provide for stock conversion and the raising of additional capital, to regulate the supply of gas, and for other purposes.

Ware Gas Light and Coal and Coke Company, Ltd.

Application is to be made by the Company for a Special Order to extend the limits of supply to include parts of the parishes of Great Amwell, Little Amwell, Ware Rural, and Thundridge; to empower them to purchase and hold lands; to increase the borrowing powers; to establish profit-sharing; and to regulate the supply of gas and the administration of the Company.

DECLARATIONS OF CALORIFIC POWER.

Havant Gas Company.—450 B.Th.U. (Jan. 1, 1923.)

GAS REGULATION ACT ORDERS.

The Director of Gas Administration has forwarded a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

Garw and Ogmore Gas Company.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 17d. per therm.

Prepayment meter clauses are included. (Nov. 7.)

Hayling Island Gas Company, Ltd.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 21d. per therm; and this price shall be substituted for the price of 6s. per 1000 c.ft. wherever it is mentioned in section 24 (price of gas) of the Hayling Island Gas Order, 1905.

After the declared date, the word "therm" shall be substituted for "1000 c.ft.," and the words "fifth of a penny" for the word "penny" wherever it occurs in paragraph (ii.) of Schedule B to the Hayling Island Gas Order, 1905. (Nov. 14)

Middlewich Gas Light and Coke Company, Ltd.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 18d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-three-quarters. (Nov. 16.)

Newbury Corporation.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 18d. per therm. (Nov. 16.)

WINDSOR GAS (BASIC PRICE) ORDER, 1922.

The Board of Trade have made an Order, bearing date Nov. 7, under section 11 of the Windsor Royal Gas Act, 1922. This section empowers the Board of Trade to make an Order fixing the price per therm of gas supplied by the Windsor Royal Gas Light Company to ordinary consumers within the limits of the borough of New Windsor and also beyond those limits—such price for the purposes of the said Act being deemed to be the basic price therein referred to, as if the same were enacted in that Act, and to take effect as from Dec. 31, 1922. The Board of Trade order accordingly that—

The basic price in respect of gas supplied by the Windsor Royal Gas Light Company to ordinary consumers shall be:

(*a*) Within the limits of the borough of New Windsor, 13·5d. per therm.

(*b*) Beyond the said limits, 14·5d. per therm.

Bye-Product Plant Fatality.—By an explosion last month at the Mitchell Main Colliery bye-product plant, four men were injured, and one named Taylor died. At the subsequent inquiry, Mr. A. Booth, engineer, said an examination of the plant showed that a cock leading from the first heater to the still had broken at the neck. As the result the connection would not be open, the oil in the heater would have no chance of escape, and the increased pressure would cause the enclosed case to burst. He agreed that the safety valve should have acted, but thought possibly it had become stuck. The Works Manager (Mr. H. Murphy) said that when the explosion occurred, he thought the heater must have been shut in, and what had since been found confirmed this opinion. So far as he knew, the safety valve was in working order before the explosion. The Coroner returned a verdict of "Accidental death," and said the Inspector of Factories had made certain suggestions regarding alterations to safety valves and cocks, which had since been carried out. He would recommend the Home Office to make regulations providing that explosions of any kind at these bye-product plants must be reported.

BRITISH SULPHATE OF AMMONIA FEDERATION, LTD.

A Notable Increase in Membership.—British Synthetic Production Joins the Federation.—Popularity of Sulphate of Ammonia.—Help Needed for Agriculture.

The Second Annual General Meeting of the British Sulphate of Ammonia Federation, Ltd., was held on the 16th inst., at the Head Office, No. 30, Grosvenor Gardens, S.W.—Mr. D. MILNE WATSON (Chairman of the Company) presiding. The report was published in last week's "JOURNAL" [p. 447].

The SECRETARY having read the notice convening the meeting and the report of the Auditors,

The CHAIRMAN said: Gentlemen,—The year reviewed in the report has been free from the alarums and excursions of the previous twelve months. If at times there have been strong headwinds, your Committee remembered how well the ship behaved when the hurricane struck her about two years ago, and we have had confidence. We have done more. We have induced confidence in others. Last spring, when other fertilizers were hard to sell, what happened in the sulphate of ammonia market? The buyers were just falling over one another to get-in their supplies.

THE POPULARITY OF SULPHATE OF AMMONIA.

They called us hard names because we could not deliver fast enough. They tried to get the Government to stop all export of sulphate of ammonia. The Nitrate of Soda Committee said: "This is a great opportunity." They plastered the country with advertisements drawing attention to the shortage of sulphate of ammonia; and at the end of the spring season they found that they still had enough nitrate in stock, carried over from the previous season, to cover the whole country. Why was, and is, it so much better with sulphate of ammonia than with other fertilizers? Because our policy was right, our price was right, and our propaganda was right. This I believe to be a fair claim to make in order to account for the great testimony to the popularity of sulphate of ammonia which we saw last season, not only in this country, but also in foreign countries. Now I do not pretend for one minute that there is not another side to this picture, and you will find that we have laid due emphasis upon it in the report. Our average price last year, from the point of view of the producer, who had to pay high wages, costly renewals, unduly heavy railway charges, dear stores, and last, but not least, more than 100 p.ct. over pre-war price for sulphuric acid—our average price, I say, was frankly disappointing; and we are the first to admit it. But this admission made, I do think we are entitled to take one more look at nitrate, and say: "It micht ha' been waur."

SULPHURIC ACID STILL TOO DEAR.

We have not said much about sulphuric acid in the report; but I think you will agree that what we have said is to the point. The present price is still about 100 p.ct. over the pre-war price, and will have to be greatly reduced if sulphate of ammonia makers are to adjust their cost of production to the level of the selling price for nitrogen, which may be expected in the not very distant future. This sums-up the hard, cold facts. I was interested, in reading the report of a recent speech of the Chairman of the National Sulphuric Acid Association, to find in it a reference to a crisis which took place in the spent oxide market a short time ago. He compares that crisis with the recent crisis in the Near East, and apparently assigns to us as producers of oxide the all too flattering rôle of the Turk. Well, I was under the impression that, for the past seven years or so, spent oxide producers and sulphate of ammonia makers had rather been playing Armenian to the acid makers' Turk. However that may be, I hope the wise counsels of those members of the Sulphuric Acid Association who are now urging a further reduction of prices will prevail. I wish to make it clear to the members of that Association that we sulphate of ammonia producers are far from satisfied with the present position, and that we intend to make the most strenuous efforts to get our acid at a much cheaper price than we are now having to pay. ["Hear, hear."]

PREFERENTIAL PRICES FOR BRITISH FARMERS.

The market policy which we adopted, and which, if the district meetings recently held are any guide, has met with very general approval by our members, has enabled us to reply to two sets of critics, who were vocal enough when the Federation was formed. The first set said: "You are forming a Trust, and you are going to try to squeeze the consumer." Well, I venture to question whether the home consumer would have got his supplies at £17 last spring while foreigners had to pay up to £22, if these gentlemen had had their way, and there had been no Federation. I also question whether, if these critics had prevailed, well over 60 p.ct. of British production would have been of the best, neutral quality, as it is to-day. The second set said: "Once you get the Federation formed and your Committee in power, they will succumb to temptation. They will gamble and go on piling up stocks, and there will be a terrible crash. They will try to be too clever." Well, we have not piled up stocks; on the contrary, we have continuously liquidated our stocks, and we have not tried to be clever. All we try to do is to conduct the Federation's affairs as plain but prudent business men. We are trying to develop our organization both at home and abroad, so that through it we may get the best and most complete information as to what is going on and what the future is likely to have in store for us. And having collected the facts in this way, we try to frame a policy which will safeguard the interests of our members and be fair to those who are the ultimate arbiters of the rightness and wrongness of that policy—I mean the consumers. Let us admit frankly that it was unfortunate that we did not have a bigger reserve for the home market last spring. We are taking steps to prevent a repetition of this, and we want you to help us by being prepared in case of need slightly to increase the storage capacity at your works. For you must remember that it is our fundamental duty to keep you sufficiently clear of stock to enable you to go on producing continuously. This is a duty in which up to now, even in our most difficult circumstances, we have never failed; and with a little help from you, I feel confident that we shall maintain the same high standard of conduct in the future. But we do—indeed, we must—rely on your co-operation. Now I have referred above to two sets of critics. We had a third. They said: "This idea of an Association or Federation worked quite well during the war, when you were in a position to keep on paying out substantial sums; but when the lean years come, you will find the members just fall-away for all that."

SYNTHETIC AMMONIA AND NITRATES, LIMITED.

Well, our first year was a difficult one, and the second was a lean one, and our members knew long beforehand that it was going to be a lean one. How, then, do we stand as regards membership? You will recall that members could give us notice to terminate their membership on May 31 last. We lost members with a capacity of 3556 tons per annum. We have retained members with a capacity of about 300,000 tons per annum—representing over 99 p.ct. of the British production. This, I think, is quite satisfactory. But I have a more satisfactory, and a much more significant piece of news for you to-day. That is, that Synthetic Ammonia and Nitrates, Limited, whom I think I may fairly call the successful pioneers in the production of synthetic ammonia in Great Britain, have decided to throw in their lot with us, and to join the Federation. They have been running a small plant, but working on a fully commercial scale, for over a year now, and their great plant at Billingham is confidently expected to reach the producing stage within the next six months or so. Their production will be on a relatively small scale to start with, but if conditions are favourable it will greatly increase hereafter. I think it is a great triumph for the idea underlying the Federation that such an enormously important new producer, who, in material resources, quantity and quality of output, and in geographical situation, is in a better position than any other individual maker in the kingdom to meet competition single-handed, should have decided to take this step at so early a stage in his operations. ["Hear, hear."] You will note that I claim the triumph for the idea which forms the basis of our constitution, and not for my colleagues or myself. Councils and Committees will come and go, but the idea will remain. And we know that if the Federation is run on the sound constitutional lines embodied in our Articles and Agreement, that idea is capable of rendering great service to producers and consumers alike. Our new friends are fully aware of this; and they intend to take the full share in the policy and conduct of the Federation's affairs to which the magnitude of their production will entitle them.

LARGE INCREASED CONSUMPTION OF NITROGEN POSSIBLE.

The great and increasing popularity of sulphate of ammonia is a reason for confidence in the future. Before the war, they used 48,700 tons of pure nitrogen in France in the form of nitrate of soda, and 19,400 tons in the form of sulphate of ammonia. In 1921 they used 23,600 tons in the form of nitrate and 25,400 tons in the form of sulphate. We have not only caught up, but we have surpassed our competitors. Our home figures show a very much greater gain for sulphate of ammonia. The moral I am going to draw from these figures is that, though we have done a little, yet that is not one tithe of what we ought to do, and what, with your help, we intend to do. We cannot afford to sit still. We must take broad views, and we must take long views, in this business, both as producers and as propagandists. We give in the report some remarkable figures showing the present consumption of nitrogen in certain countries. Germany is at present consuming purely for agricultural purposes about 320,000 tons of pure nitrogen per annum; and this works out at no less than 10·3 lbs. per acre, comparing with 2·01 lbs. per acre used in France, and about 4½ lbs. per acre used in the United Kingdom. I think you will agree that this is a remarkable achievement on the part of Germany; and it seems to point to the fact that the figure of 12 lbs. of pure nitrogen per acre which we have indicated as the attainable consumption of nitrogen, is well within the bounds of possibility. France, Germany, and the United Kingdom are at present using about 404,300 tons of nitrogen per annum. On the basis of 12 lbs. per acre of arable land, they could, and should, be using about 755,500 tons per annum.

While you will have seen from our market reports and from the reports of the proceedings at recent district meetings that the prospects, as far as price is concerned, are now quite good for the present year, and while for the present I believe we have little to fear from Germany or America, we must not let ourselves be lulled into any false sense of security.

COST OF PRODUCTION AND CHILE NITRATE.

As producers, we must keep a sharp look-out in every direction, with a view to reducing our costs to a minimum. The report draws attention to several means to this end. Our engineers and chemists will doubtless be able to find others. This is really a matter of supreme importance, because we have not only to face competition in costs from synthetic producers of nitrogen, but we may also be quite sure that, as the production of sulphate of ammonia grows, the Chilian nitrate companies will make determined efforts to reduce their costs by getting a higher yield. At present I think I am correct in saying that they are only able to extract about 50 p.ct. of the nitrate contained in the deposits. We have been expecting for some time to hear that an improved extractor or filter had been invented, and the Technical Press has recently referred to a new method of extraction which will give a far higher yield than their present method. Their present cost is roughly £8 10s. per ton, and this includes the royalty of £2 10s. per ton levied by the Chilian Government. These facts, I think, give you the measure of the competition which we are likely—which we are certain—to have to meet in the future.

LOW COST OF ADMINISTRATION.

Your Council and Executive Committee, for their part, are doing all in their power to effect the utmost economies in cost of administration and in charges for transportation and distribution. We have given several instances in the report; but I would just like to add that we have reclaimed no less than £2440 from the railway companies for overcharges and rates wrongly charged since last January, and our cost of administration is now only about 1s. 4½d. per ton. I want you all to understand that we do realize that the Federation can only be a

success if we do our work, not only as well as any individual producer would do it, but much better. This is the standard which we, who are directing and managing your affairs in sulphate of ammonia, have set ourselves, and which we are determined to attain and to maintain.

THE NEW GOVERNMENT AND BRITISH FARMERS.

I referred in my speech last year to the position of agriculture in this country, and I threw out a suggestion that the Government might perhaps find it possible to allot some of the money which was used as a guarantee for the export credits to assist the British farmer. Nothing has been done in this direction, and at the present time we have only the vaguest possible promises in regard to agriculture from the present Government. I am still of opinion that it would be good business for the country to help the farmers, especially at the present time. I believe that if we could grow more food here we could substantially raise the value of the pound in relation to the dollar, and thus secure a further easement in the payment of our war debt to the United States. I am pleased to see that, in a letter to the National Farmers' Union, the present Prime Minister has indicated that the Government are prepared to consider encouragement of improved credit facilities to agriculturists, and the promotion of education and research. I think it is up to all of us to impress upon our local Members of Parliament the parlous state of agriculture, and to urge them to insist on the Government's doing something practical, along the lines indicated, to relieve the distress. Nevertheless, as in previous years, we must, I think, in the main rely on ourselves. ["Hear, hear."]

The enormous difference between the consumption of nitrogen in Germany, on the one hand, and in the United Kingdom and France on the other, shows that there is a vast field for extension of our work. In the main that work must be educative]; and for this reason we give our propaganda staff instructions always to tell the farmer nothing but the truth according to the best of their knowledge, and not to recommend sulphate of ammonia in cases when some other form of nitrogen would be better. This, I feel sure, will pay us in the long run. You will see from the report that we have also been supporting the magnificent scientific and educative work carried on at Rothamsted. We intend to continue this support, and also to render assistance to other agricultural institutions. ["Hear, hear."]

On the motion of the CHAIRMAN, seconded by Mr. E. J. GEORGE (Consett Iron Company, Ltd.), Vice-Chairman, the report and accounts were adopted *nem. con.* The Auditors (Messrs. Thomson M'Lintock and Co.) having been re-appointed, the CHAIRMAN moved, and Mr. A. STANLEY (Simon-Carves, Ltd.) seconded, a resolution to continue propaganda work.

On the motion of Mr. A. BLENKINSOP (Dalton Main Collieries, Ltd.), seconded by Mr. H. H. BARRETT (John and James White, Ltd.), the meeting then re-elected Mr. D. Milne Watson (Gas Light and Coke Company) Chairman, and Mr. E. J. George and Mr. A. K. M'Cosh (Wm. Baird and Co., Ltd.) Vice-Chairmen, for the ensuing year.

A cordial vote of thanks and appreciation of his services was accorded to the General Manager (Mr. F. C. O. Speyer), on the motion of the CHAIRMAN, seconded by Mr. GEORGE.

Mr. SPEYER briefly returned thanks on behalf of the staff.

The proceedings terminated with a hearty vote of thanks to the Chairman, proposed by Mr. A. READ (Bolckow, Vaughan, and Co., Ltd.), and seconded by Mr. W. L. JOHNSON (Bell Bros., Ltd.), which was carried with acclamation.

IMPERIAL CONTINENTAL GAS ASSOCIATION'S CLAIM.

In view of the dissatisfaction felt in certain quarters of the City concerning the rate of liquidation by the Government Clearing Office, Enemy Debts, of moneys still outstanding from Germany, a representative of the "Financial News" called last Thursday upon the Secretary of the Imperial Continental Gas Association, which is one of the largest of Germany's creditors, and subsequently upon the Government Clearing Office.

In the course of the interview, the Secretary (Mr. F. H. James) said: Our claims against Germany amounted originally to a very large sum of money. The total was split into three classes of claim, as follows: (1) Pre-war debt; (2) proceeds of liquidation of concerns in Germany; and (3) compensation for deprivation of the proceeds of liquidation of our German undertakings and for the inadequacy of the price finally awarded for these. The first two classes have been liquidated; and we are now endeavouring to obtain payment of the third, which amounts to the considerable sum of £1,550,000. Up to the present, however, we have not succeeded in obtaining any satisfaction, despite the fact that four years have passed since the signing of the armistice. The delay is very difficult to understand; and the dissatisfaction of our shareholders is increased by the fact that this money carries no interest. The figure was agreed in Berlin as long ago as November last, and this agreement was sanctioned by the Anglo-German Mixed Arbitral Tribunal in March, eight months ago. It is true that the Department must in justice make due provision for meeting priority claims such as we ourselves have already had settled; but we feel that the time has long since passed when the Department can reasonably deny the possibility of striking a balance between the total funds available and the total of claims to be met.

An official in the Clearing Office was also interviewed, and he admitted that it was very hard for business interests to be kept out of their money. After referring at length to a report issued by the Department on Sept. 26, he went on to say: The claims for compensation will be paid as soon as we are satisfied that the prior claims are secured. We hope to be able to make payments on account in two or three months. It is quite a mistake to think that we are waiting for further remittances from Germany before paying out, and it is equally wide of the mark to attribute to the Department any desire to build-up a large balance which would earn interest. Our one desire is to liquidate the whole account and to pay off all claimants as quickly as possible.

MESSRS. BRADDOCK'S WAR MEMORIAL.

In the presence of members of the management and the office staff, the handsome brass roll of honour (a photograph of which is here reproduced) was last Saturday week unveiled in the entrance to the offices of Messrs. J. & J. Braddock's Globe Meter Works, Oldham.

The unveiling was performed by the Managing-Director (Mr. G. H. Braddock, J.P.), who said that he hoped and believed the memorial was one of which they would all be proud. It was made in their own workshops and afterwards excellently engraved in Manchester, and was intended to be a lasting expression of respect for those of their

The Roll of Honour.

comrades who were called upon to make the supreme sacrifice in the war, and of their regard for all who served with the Colours. He was thankful that so many had been able to return to them.

The roll of honour has the classic outline adopted for the design of one of the firm's large station meters, of which it is a proportionate model, and it bears the honoured names of all of their employees who served with the forces. Mr. Braddock, uncovering the memorial, laid a wreath below it on behalf of the management and staff.

BELFAST GAS-WORKS EXTENSION PROJECT.

In connection with the Belfast Gas-Works extension, it was proposed, at a meeting of the Corporation, to refer back to the Gas Committee the report of the Sub-Committee recommending the purchase of the North of Ireland Chemical Company's undertaking, at a cost of £60,000—including land, plant, and interest of vendors. Mr. D. GORDON (the mover of the amendment) said they should be supplied with a report showing how the estimate was made.

Mr. CAMPHILL, the seconder, stated that the agreement between the Corporation and the Chemical Company in regard to the sale of residuals would expire within the next two years, and the Company's machinery would then be to a large extent obsolete. He urged that they should have an independent valuation of the land, buildings, and machinery.

Alderman BOYD said the City Accountant, the City Surveyor, and the Chairman of the Committee had gone into the whole question, with the assistance of the Town Solicitor; and it was upon the information they had gleaned upon the Company's trading accounts, &c., that they had based their decision. The agreement mentioned had still nearly two years to run; and the Committee were satisfied that they were making a good bargain for the Corporation and for the ratepayers. It was mentioned that Mr. J. D. Smith (the Gas Engineer and Manager) had said he would be able to pay off the capital cost in five years.

After further discussion, the amendment was, on a division, defeated by 23 votes to 10.

Loddon Gas Supply.—The annual meeting of the Loddon (Norfolk) Gas Consumers' Company, Ltd., was presided over by Mr. Edward Cadge. The report of the Directors for the twelve months ended June 30 last stated that the balance of profit for the year was £52 18s. 2d. Adding the balance carried forward from last year's net revenue account (£25 10s. 5d.), and deducting net revenue charges of £59 2s. 3d., there was a balance of net profit of £19 6s. 4d. This would be carried forward, and the Directors regretted that they could not recommend a dividend. The indifferent results of the year's working were due to the coal dispute, which necessitated the purchase of coal of poor quality at exorbitant prices. The report and balance-sheet were adopted.

THE SUGGESTED THERM INQUIRY.

Further London County Council Action Foreshadowed.

At the meeting of the London County Council on Tuesday of last week, Mr. E. Sanger (the Chairman of the Public Control Committee), replying to a question by Mr. W. C. Johnson, said that no answer had yet been received from the Board of Trade in response to the Council's request for an immediate inquiry as regarded the method of charging for gas by the therm.

He added that the Board of Trade had again been approached to know when the inquiry would be likely to take place. He had no information as to whether any of the gas companies were taking steps to prevent the inquiry being held. Should an early and favourable answer not be received from the Board of Trade, Mr. Sanger assured the Council that the Committee would press forward with all means at their command for the holding of the inquiry.

TRADE NOTES.

Barrowfield Iron-Works, Ltd.

A notice has been received from the Liquidator of the Barrowfield Iron-Works Company (Mr. A. S. Macharg, C.A.) which informs us that, though the Company has been formally liquidated for family reasons, the business will be continued as hitherto, and all liabilities of the old Company will be duly discharged. The business will be carried on under the name of the Barrowfield Iron-Works, Ltd.; and Mr. P. Baxter, the Manager of the old Company, has been appointed Managing-Director. Any communications regarding new business should be addressed to the new Company, at its registered office: Fordneuk Street, Bridgeton, Glasgow.

Robert Dempster & Sons' Gasholders.

Specialities manufactured by them for spiral gasholders are described and illustrated in a new booklet prepared by Messrs. Robert Dempster & Sons, Ltd., of Elland, Yorks. These specialities are the "Elland" patent axleless carriages, swivel carriages, ladders, and anti-freezing apparatus. There are many photographs of holders actually erected by the firm on the spiral system, as well as some of standard-guided ones. Messrs. Robert Dempster & Sons also make tanks for oil, tar, liquor, and other storage purposes, for the turning-out of which both expeditiously and economically their works are well equipped. Views included of the various shops, &c., show how extensive these works are.

Silica and Fireclay Refractory Products.

The present scope of the Newfield Brickworks of Messrs. Bolckow, Vaughan, and Co., Ltd., of Middlesbrough and London, includes the manufacture of silica, high-grade refractory clay, and fireclay products, the raw materials for which are drawn from the Company's deposits. A department for the manufacture of magnesite and other special refractories will be added. A catalogue has been prepared by the firm illustrating a few of the commoner shapes manufactured, and in this it is pointed out that the use of silica refractories is increasing rapidly for coke-ovens and gas-retorts—the higher conductivity and refractoriness permitting of a largely increased output, while a sensible increment in life is secured. There will be found in the catalogue cross-sections through the retort-house of vertical retort installations by West's Gas Improvement Company, Ltd., the Vertical Gas-Retort Syndicate, Ltd., and Messrs. Goodall, Clayton, and Co., Ltd.; of the Talbot gas-producer, by the Power Gas Corporation, Ltd.; the Morgan gas machine, by the International Construction Company, Ltd.; a number of gas-fired furnaces, &c. Pages of useful tables include the melting points of Seger cones, a comparison of Centigrade and Fahrenheit thermometers, and weights per cubic foot of various materials.

Welsbach Advertising Campaign.

From the Welsbach Light Company, Ltd., Gray's Inn Road, W.C., has been received a large packet of excellent advertising material, comprising a complete range of showcards, leaflets, and various novelties, for shop window and other display. This is in connection with the Company's advertising campaign for the present season—a campaign, it is claimed, of greater magnitude than any hitherto undertaken in the gas mantle and burner industry. Already a striking new Welsbach poster is appearing on the hoardings of more than 1000 towns and suburbs; over 100 of the most influential newspapers are carrying the first of many autumn season Welsbach advertisements; and Welsbach advertising matter is appearing in the national weekly illustrated papers. The poster, with a picture of a lighthouse, bears the words: "A Welsbach house is always a light house." In these ways, and by means of the first-rate showcards, leaflets, &c., for the use of traders, householders throughout the country are being reminded in a forcible manner of the merits of Welsbach mantles, burners, and radiators. A special feature is being made of the Welsbach "Economy" burner, which it is claimed "using gas at to-day's average price per therm, gives five hours' light at a cost of less than one-farthing."

Meldrum Sprinkler Stokers.

Some time ago, Messrs. Meldrums, Ltd., of Timperley, near Manchester, fitted their stokers for firing coke breeze at the Kilmarnock Gas-Works; and after six months' working, Mr. Charles Fairweather (the Engineer and Manager) states that their installation has in every way been justified—as is proved by economy in labour, economy in fuel, and better steam supply. They are fitted to Lancashire boilers, and were adopted not only for reducing labour costs in connection with the boilers, but for the specific purpose of being able to consume coke breeze. Under the old conditions there were needed, during mid-winter, about one wagon per day of first-class dross (or seven wagons per week) to enable the department to consume a maximum quantity of coke breeze. Since the stokers were fitted, they have required only about two wagons of dross per week, and this with a better steam supply. At the same time, they have improved very considerably the draught to the boilers, and draught is a matter of prime importance with coke breeze consumption. They practically never use the blowers now, these only being required to brighten-up the fires after cleaning. This interesting application of their stokers is one for which Messrs. Meldrums have at present several further inquiries in hand. A new list of their oil and tar burners has been issued by the firm.

A NEW CLASS OF DYESTUFFS.

A demonstration before experts of how a mixture of silk and cotton may be dyed two colours in a single dye-bath at the same time was given in the chemical lecture theatre of Manchester University last Friday night, by Prof. ARTHUR G. GREEN and Mr. KENNETH H. SAUNDERS, the discoverers of the new class of dyestuffs known as Ionamines. The occasion was a lecture delivered before a joint meeting of the Society of Dyers and Colourists and the Society of Chemical Industry.

The authors said that their discovery of the Ionamines in the research laboratories of the British Dyestuffs Corporation provided a means of readily dyeing acetate silk in any depth of shade, a process which had hitherto presented difficulties owing to this fibre's want of affinity for acidic and direct dyestuffs. The colours produced—yellow, orange, and red—could be further changed to such shades as browns, reds, violets, blues, and blacks by the operations of diazotisation and development which are well known in cotton dyeing.

After a discussion of the nature of the physical problem presented in the dyeing of acetate silk, an account was given of the chemical constitution of the new dyestuffs and of the steps which had led to their discovery. It was pointed out that the large range of dyestuffs which could be produced were characterized by great fastness to washing and wear. In all cases their resistance to light was sufficient; in some instances it was remarkably good. The new class of dyestuffs appeared to open up great possibilities in the dyeing of mixed materials composed of acetate silk and cotton, acetate silk and linen, or acetate silk and viscoe silk; for by using a dye-bath containing a mixture of an Ionamine with a suitable direct cotton dye, each fibre would select its appropriate dyestuff. By this means either solid shades or two-colour effects might be produced as desired.

A number of very effective experiments were made during the lecture, which was also illustrated by a beautiful collection of silk skeins, jumpers, and hosiery material dyed in a variety of shades.

Waterford Gas Company.—The Directors of the Waterford Gas Company have declared a dividend of 3¾ p.ct., the same as last year. The carry-forward is £6107, against £7916.

Cheaper Gas at Wirksworth.—The Wirksworth (Derbyshire) Gas Company have notified consumers that the price of gas has now been reduced in their area by a further 5d. per 1000 c.ft., which brings it down to 7s. 6d. The pre-war price was 4s. 2d. per 1000 c.ft.

Gas Price at Brighton.—A reduction of ½d. per therm in the price of gas which is being made by the Brighton and Hove General Gas Company, as from the reading of the meter indices for the current quarter, brings the total reduction since June, 1921, up to the equivalent of 17d. per 1000 c.ft.

Penal Servitude for Pretended Gas Official.—At the Old Bailey, the Recorder sentenced John Cowie, a motor driver, to five years' penal servitude for theft from three dwelling houses. It was stated that the prisoner, by pretending to be a gas company's official, gained entrance to the houses on the plea that he had come to put the fittings right. He then stole property that he found handy. There were previous convictions against the prisoner, including two terms of penal servitude.

Gas for Wroxham.—Wroxham (Norfolk) is rapidly extending as a residential centre of the famous Broads district; and it is typical of the enterprise of the British Gas Light Company at Norwich, that they are now engaged upon laying a main from their works to this resort, which is several miles distant. Gas for heating and illuminating purposes will therefore be available for the villages *en route*, and will provide a much-needed requirement. It is anticipated that the main will be completed very shortly.

A Defective Geyser Flue.—A verdict of "Accidental death, the result of poisoning by gas escaping from a geyser," was returned at an inquest held at York Military Hospital on the body of Captain Guy Percy Simpson, R.F.A. It was stated that Captain Simpson returned from hunting, and his servant prepared a bath for him. Returning to the bathroom forty minutes later, the batman found Captain Simpson sitting in the bath dead. There was a strong smell of gas in the room; and outside a ventilating pipe, which belonged to the geyser, was broken, and had been unmended for three weeks. The Coroner commented on the delay in mending the pipe, and said he thought the matter should be the subject of an inquiry by the military authorities.

York Gas Company's Cookery Competition.—In connection with the schoolgirls' cookery competition promoted by the York Gas Company, the annual distribution of prizes took place on Nov. 8, at Micklegate Bar School. Mr. H. E. Bloor (Secretary and Manager to the Gas Company) presided, and was supported by the Secretary of the York Education Committee (Mr. G. H. Gray) and other leading educationists of the city. The prizes were presented to the girls, whose achievements had all been carried out by gas-cooking, by Mrs. Stoors-Fox. The Chairman said this was the sixth competition since the inauguration by the Gas Company, who wished to emphasize the importance of food being well and properly cooked. The Company realized that a large proportion of people employed gas-cookers, and felt they ought to do something to encourage the use of the best appliances and methods. The Company were giving prizes of cookery books to all who took part in the competition proper, because those girls were selected by the schoolmistresses as the representatives of their particular school.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 20.

The London pitch market remains very strong with only small supplies available. The minimum price is about 125s. net per ton *ex* makers' works. Creosote is also firm, at about 7½d. net per gallon in bulk. Other products are unchanged.

Tar Products in the Provinces.

Nov. 20.

The average values for gas-works products during last week were: Gas-works coal tar, 69s. to 74s. Pitch, East Coast, 117s. 6d. to 122s. 6d. f.o.b. West Coast—Manchester, 117s. 6d. to 120s.; Liverpool, 118s. 6d. to 121s.; Clyde, 120s. to 122s. 6d. Benzole 90 p.ct. North, 1s. 9d. to 1s. 10d.; crude 65 p.ct. at 120° C., 1s. 1½d. to 1s. 2½d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 10d. to 1s. 11d. Toluole, naked, North, 2s. to 2s. 3d. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 2s. to 2s. 1d. Creosote, in bulk, North, liquid, 6½d. to 6¾d.; salty, 5¾d. to 6d. Scotland, 5d. to 5½d. Heavy oils, in bulk, North, 6¼d. to 6½d. Carbolic acid, 60 p.ct., 2s. to 2s. 1d. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 15.]

Nos. 30,241 to 30,927.

ALDRIDGE, J. G. W.—"Apparatus for charging and discharging gas-retorts." No. 30,823.
BOWEN, H. J.—"Gas-burners." No. 30,288.
CAPON, E. O.—"Gas-producers." No. 30,550.
CAPON, E. O.—"Apparatus for cooling and cleaning gas." No. 30,551.
CAPON, E. O.—"Gates for gas-producers, &c." No. 30,552.
CAVE, C. B. CAVE-BROWNE—"Gas cooking-rings, &c." No. 30,716.
COLEY, H. E.—"Gas manufacture." No. 30,773.
COLEY, H. E.—"Geysers, &c." No. 30,774.
FOX, J. T.—"Air or gas pressure gauge." No. 30,497.
GAS RESEARCH CO.—"Gas-generators." No. 30,678.
HENSHAW, D. M.—"Apparatus for bringing liquids and gases into intimate contact." No, 30,346.
HILDMANN, P.—"Burner for gaseous fuel." No. 30,816.
HOLMES & CO., LTD., W. C.—See Henshaw, D. M. No. 30,346.
LANE, E. J.—"Pump, blower, gas-exhauster, or rotary engine." No 30,590.
LEHANE, A. T.—"Manufacture of retorts, &c." No. 30,764.
MILLNER, W.—"Illuminating-devices." No. 30,456.
RUCK, E.—See Lehane, A. T. No. 30,764.
SCHULMEYER, J.—See Hildmann, P. No. 30,816.
STANLEY, T.—"Incandescent mantle rod and smoke-shade support." No. 30,517.
SWAN, J. W.—See Bowen, H. J. No. 30,288.
WELLS, G.—"Incandescent inverted mantle guard and fire preventer." No. 30,354.
WELLS, J. F.—See Capon, E. O. Nos. 30,550, 30,551.
WHITTELL, J.—See Henshaw, D. M. No. 30,346.
WOOD, H.—"Gas-retorts." No. 30,919.

Ellesmere Gas Undertaking.—An animated discussion on the question of the gas-works took place at a recent meeting of the Ellesmere Urban District Council—particularly with regard to the proposed engagement of an expert to advise the Council as to the reconstruction of the works. The Gas Committee desired that this should be done at once; but the Council deferred taking steps in the matter until next summer. Mr. Hallett and Mr. Kesterton (members of the Committee) thereupon resigned their positions.

Oriental Gas Company, Ltd.—At the annual meeting of the Company next Wednesday, the Directors will submit the accounts for the financial year ended June 30, and will report that the revenue account presents a highly satisfactory result of the working for the twelve months. The sales of gas reached a total wholly unprecedented in the history of the Company, and the gas-rental for that period exceeded the corresponding receipts for the previous year by £13,411. This increase was the natural result of the growth of the Company's business, and was unaided by any rise in the price of the gas to the consumers. The amount yielded by the sale of residual products is higher than that of the corresponding return for the year ended June, 1921, by £7753, chiefly owing to the large demand for the Company's coke, the high quality of which has been well maintained. The only unsatisfactory item in the accounts is that of exchange, which is beyond the power of the Directors to control. During the financial year the exchange value of the rupee has averaged slightly below the par value of 1s. 4d., and has produced an adverse result of £212 10s. 3d. Climatic conditions and labour unrest have united to impede the progress towards completion of the new gasholder, and of other important operations in connection with the equipment and plant rendered necessary by the growth of the Company's business. Calcutta was visited with torrential storms of rain, of a magnitude in volume sufficient to cause disastrous floods; but the Directors are able to report that no serious substantial damage has been caused to the works. The Board recommend the payment on the 30th inst. of a dividend at the rate of 4½ p.ct., less income-tax, making, with the interim dividend of 3½ p.ct., less tax, paid in May last, a total dividend of 8 p.ct., less tax, for the year.

By Appointment
Ironfounders to
H.M. the King.

CARRON
Patent
"STELLA"
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STOCK MARKET REPORT.

THE Stock Exchange last week opened in uncertain mood, and business was quiet on Monday. But the tone began to improve next day, and continued so on Wednesday in view of a rally in foreign exchanges and less despondent feelings as to the position in the Near East. The gilt-edged market became firmer, and Home Government issues rose; the big four marking: Consols 57⅛-57⅜, War Loan 99 5/16-99 9/16, Funding 87⅛-87⅜, Victory 88⅝-89¼. After a check arising from some Election returns, things ultimately became cheerful. Home Rails and Argentines were strong, and the Foreign Market wound-up with a rally.

Business in the Gas Market was rather below the previous week in point of volume; but the general tone was quite satisfactory, and a few notable advances in quotations were made. In the London Companies, Gas Light ordinary fell ½, but South Metropolitan gained ½, and Commercial was steady. In the Suburban and Provincial category, British rose 2, Croydon sliding-scale 5, ditto maximum dividend 2½. In the Continentals, Imperial was marked the equivalent value *ex div.*, and European fell ½. Union proposes to pay a 4 p.ct. less tax dividend on the preference stock on Jan. 2. Monte Video fell 2.

The following transactions in gas during the week were reported: On Monday, Brentford "B" 100½, 100¾, 101. Brighton and Hove "A" 124½, Chester 72½, European 9½, Gas Light ordinary 94⅜, 94⅝, 95, 95⅛, 95 1/16, 95⅛, ditto maximum 62½, ditto 4 p.ct. preference 79. Imperial Continental 155, 156, Primitiva preference 41s. 3d., South Metropolitan 95½, South Suburban 97½, 98½, ditto 5 p.ct. debenture 97, Tottenham "B" 100¾, 101¼, Liverpool 7 p.ct. preference 106, Colombo 7⅛, 7 1/16. On Tuesday, Brentford 4 p.ct. debenture 77½, British 32½, Gas Light ordinary 94⅜, 95, 95¼, 95⅛, 95⅝, ditto maximum 63, ditto 4 p.ct. preference 79, 79⅝, Primitiva preference 42s. 6d., 43s. 9d., 44s. 4½d., Sheffield "B" 98, ditto "C" 98, 98½, South Metropolitan 95, 96½, ditto 3 p.ct. debenture 62½, 63, ditto 6½ p.ct. debenture 105⅝, 106⅜, South Suburban 5 p.ct. debenture 98½, Tottenham "B" 100⅜, 101½, Kingston 86, 86½, Southend 5 p.ct. new 80½, 81, Metropolitan of Melbourne shares 7⅞, 7 15/16, Tottenham 5 p.ct. preference 90, Wandsworth 4 p.ct. debenture 77½. On Wednesday, Alliance and Dublin 4 p.ct. debenture 64½, Brentford 4 p.ct. debenture 78, European 9¼, 9⅜, Gas Light ordinary 94⅛, 94⅜, 95, 95⅛, 95⅜, 95⅛, 95⅝, 96, Imperial Continental 152⅛, 156½, ditto 3½ p.ct debenture 74, 74½, Liverpool 91½, ditto 7 p.ct. preference 106, Primitiva preference 43s. 1½d., 43s. 7½d., 45s., South Metropolitan 96, 96½, 96⅝, South Suburban 97½, 98, 98½, Tottenham "B" 101, 101½. On Thursday, Brentford "A" 100, Commercial 4 p.ct. 94½, ditto 3½ p.ct. 94½, ditto 3 p.ct. debenture 56, European 9¼, 9½, Gas Light ordinary 94⅛, 94⅜, 94⅜, 95, 95⅛, 95⅜, 95⅛, ditto maximum 62½, Imperial Continental 152, Primitiva preference 43s., South Metropolitan 95⅝, 96, Liverpool 7 p.ct. preference 105, 106, 106½. On Friday, Bombay 95s., British 32, Commercial 4 p.ct. 94½, 95, ditto 3½ p.ct. 94, ditto 3 p.ct. debenture 58½, European 9⅜, 9 3/16, 9 5/16, 9½, Gas Light ordinary 94, 94⅛, 94⅜, 95, 95⅛, 95⅜, 95⅛, ditto 4 p.ct. preference 79, 79⅜, 80, ditto 3 p.ct. debenture 62, 63, Imperial Continental 152, 152½, 152⅜, ditto 3½ p.ct. debenture 74, Oriental 101, Primitiva preference 43s. 9d., 44s. 6d., 45s., 45s. 6d., South Metropolitan 95½, 95⅜, 96½, South Suburban 97½, Tottenham "B" 101½, Liverpool 7 p.ct. preference 106½.

In the Money Market, the position at the opening was quite firm; but thenceforward rapid fluctuations ensued, the demand being at times pronounced, only to be followed by marked relaxation. At the close, the position was quite comfortable. Discount rates ruled firm at first, but eventually became quite easy before the close. Silver fell under the action of sales and touched 32½d. The Bank of England rate was 3 p.ct., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
182,049	Stk.	Aug. 24	4	4%	Aldershot 4 p.c. Pref.	..	68—73	...
1,551,868	,,	Oct. 5	2½	5%	Alliance & Dublin Ord.	59—64	62—67	...
374,000	,,	July 13	4	4%	Do. 4 p.c. Deb.	76—79	60—65	64½
280,000	5	Oct. 19	7½	4/-	Bombay, Ltd.	5⅞—6½	4½—5	95/-
100,000	5	Aug. 10	16	7½%	Bournemouth Gas and Water { 5 p.c.	..	11—12	...
383,110	10	,,	7	7%	Bournemouth Gas and Water { B 7 p.c.	15—15½	10½—11½	...
115,000	10	,,	6	6%	Bournemouth Gas and Water { Pref. 6 p.c.	13½—14	8½—9½	...
162,065	—	June 29	—	4%	Bournemouth Gas and Water { 4 p.c. Deb.	..	73—78	...
992,045	Stk.	July 27	14	6½/-	Brentford A Consolid.	261—266	100—103	100
734,920	,,	,,	11	6½/3	Do. B New	204—209	100—103	100¼—101
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	82—87	...
221,400	,,	June 15	4	4%	Do. 4 p.c. Deb.	91—93	75—80	77½—78
214,775	,,	Aug. 24	11	11½%	Brighton & Hove Orig.	208—213	165—170	...
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	120—125	124½
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	..	..	...
530,000	20	Oct. 5	12½	22/6	British	44—45	32—34	32—32½
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	55—60	...
100,000	10	Nov. 2	—	—	Cape Town & Dis., Ltd.	1½—2½	6½—7½	...
100,000	10	Oct. 19	—	—	Do. 4½ p.c. Pref.	4—6	6—7	...
100,000	Stk.	June 29	4½	—	Do. 4½ p.c. Deb. Stk.	70—75	73—78	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Stk.	108—110	..	72½
1,513,280	,,	July 27	5/9/4	56/-	Commercial 4 p.c. Stk.	106—108	93—98	94½—95
560,000	,,	,,	5½	55/-	Do. 3½ p.c. do.	103—105	93—98	94—94½
475,000	,,	June 15	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—60	56—58½
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	29—34	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	51—56	...
660,000		Sept. 1	—	6%	Croydon sliding scale.	..	95—100	...
284,975		,,	—	5%	Do. max. div.	..	80—85	...
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	..	72½
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
1,002,180	10	July 13	10	5/0	European, Ltd.	17½—18	9—10	9½—9½
16,298,975	Stk.	July 27	4/17/4	52/-	Gas Light { 4 p.c. Ord.	98—102	94—96	94—96
2,600,000	,,	,,	3½	35/-	Gas Light { 3½ p.c. max.	76—79	61—64	62½—63
4,062,235	,,	,,	4	4%	Gas Light { 4 p.c. Con. Pref.	96—99	76—81	79—80
4,674,850	,,	June 15	3	3%	Gas Light { 3 p.c. Con. Deb.	72½—74½	61—64	62—63
130,000	,,	Dec. 11	10	10%	Coke { 10 p.c. Bonds	..	..	...
—	—	—	—	—	Coke { 7½ p.c. Ilford Deb.	..	..	...
82,500	,,	Sept. 21	5	65/7½	Hastings & St. L. 5 p.c.	..	95—100	...
258,740	,,	,,	3½	50/7½	Do. 3½ p.c.	87—89	77—80	...
70,000	10	May 18	11	7½%	Hongkong & China, Ltd.	16½—16½	6—7	...
86,600	Stk.	Aug. 24	9	9½%	Hornsey 7 p.c.	..	127—132	...
1,976,000	,,	Nov. 16	9	£5	Imperial Continental	150—160	150—155*	152—156½
404,800	,,	Aug. 10	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	71—76	74—74½
235,242	,,	July 27	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord.	..	..	91½
165,736	,,	Aug. 10	7/5/6	87/3	Maidstone 5 p.c.	..	87—92	...
63,480	,,	June 29	—	3%	Do. 3 p.c. Deb	..	54—59	...
75,000	5	,,	6	6%	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4½—4¾	3½—3½	...
250,000	100	Oct. 2	4½	4½%		99—101	89—96	...
541,920	Stk.	June 1	4	4%	Monte Video, Ltd.	11½—12	60—65	...
1,875,892	,,	July 27	4½	4½%	Newcastle & Gatsh'dCon.	98½—99½	78—80	...
529,705	,,	June 29	3½	3½%	Do. 3½ p.c. Deb.	82—83	68—70	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	..	...
55,940	10	Aug. 24	7/14/0	7/8⅝	,, ,, 7 p.c.	14—15	10½—11½	...
300,000	Stk.	May 18	8	8%	Oriental, Ltd.	117—122	98—103	101
60,000	5	—	10	—	Ottoman, Ltd.	7½—7½	2—3	...
188,120	Stk.	June 29	—	6/3/9%	Plym'th & Stonh'se 5 p.c.	..	93—98	...
60,000	50	Aug. 24	13	65/-	Portsea Island, B	128—131	100—105	...
100,000	50	,,	12	60/-	Do. C	118—121	85—90	...
249,980	5	—	8	—	Primitiva Ord.	5½—6	1 1/16—1 3/16	...
499,960	3	—	5	—	Do. 5 p.c. Pref.	4½—5	2—2½	41/3—45/6
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	70—75	...
600,000	Stk.	July 27	4	4%	Do. ,, 1911	..	55—60	...
346,198	,,	June 29	4	4%	River Plate 4 p.c. Deb.	85—87	55—60	...
150,000	10	Sept. 21	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	5½—6	...
125,000	50	July 3	5	5%	San Paulo { 5 p.c. Deb.	47—49	35—38	...
135,000	Stk.	Aug. 24	10	5%	Sheffield A	223—224	97—99	...
209,984	,,	,,	10	5%	Do. B	222—224	97—99	98
523,500	,,	,,	10	5%	Do. C	220—222	97—99	98—98½
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	..	..	...
90,000	10	Nov. 2	9	7%	South African	10½—11½	7—9	...
6,609,895	Stk.	July 27	5/4/0	5%	South Met. Ord.	111—113	95—97	95—96½
250,000	,,	July 13	—	5%	Do. Red. Pref.	..	94—96	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	61—64	62½—63
224,820	,,	Aug. 24	8½	8½%	South Shields Con. Stk.	157—159	106—108	...
1,087,795	,,	,,	6	6%	S'th Suburb'n Ord. 5 p.c.	114—116	97—100	97½—98½
368,837	,,	June 15	5	5%	Do. 5 p.c. Deb. Stk.	116—118	95—100	97—98½
647,740	,,	Nov. 2	5	7%	Southampton Ord.	99—102	77—82*	...
121,375	,,	June 29	4	4%	Do. 4 p.c. Deb. Stk.	..	63—68	...
120,000	,,	July 27	—	7½%	Tottenham { A 5 p.c.	135—138	112—117	...
782,273	,,	,,	6	6%	Tottenham { B 3½ p.c.	115—117	100—103	100½—101½
181,255	,,	June 15	4	4%	District { 4 p.c. Deb.	87—89	75—80	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	¼—¼	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	20—30	...
236,476	Stk.	Aug. 24	5	2½%	Tynemouth 5 p.c. max.	108½—109	79—81	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	July 27	8½	72/6	Wandsworth A 5 p.c.	151—156	111—115	...
255,636	,,	,,	6½	57/6	Do. B 3½ p.c.	129—134	95—100	...
108,075	,,	,,	—	50/9	Do. C	..	87—92	...
140,865	,,	,,	—	50/9	New Ordinary	..	87—92	...
352,000	,,	,,	6½	53/9	Wimbledon 5 p.c.	117—122	95—100	...
98,000	,,	,,	6½	58/9	Epsom 5 p.c.	121—126	95—100	...
88,416	,,	June 29	3	3%	3 p.c Deb. Stk.	66—69	57—60	...

* Ex Div.

SHARES FOR SALE.

(*See also p.* 515.)

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Gas Explosion in a Tipton Road.—At Tipton, the roadway was torn up and tramway traffic interfered with by an explosion. Heavy traffic had broken the gas and water mains; and while the latter was being repaired, flames from a fire bucket caused a gas explosion.

Irish Gas Troubles.—A holder at the Drogheda Gas-Works was punctured by rifle bullets during recent shooting in the town, and 40,000 c.ft. of gas escaped. Dislocation of gas service at Queenstown arose from a strike of 40 employees, because the Gas Company's collector of accounts refused, at the demand of certain members, to join the Transport Workers' Union.

Montgomery Gas-Works.—A letter from Mr. T. W. R. Sargent, of Bishop's Castle, was read at a meeting of the Montgomery Town Council, stating that he would be glad if the Council would allow him a lease of the gas-works. He would guarantee a good supply of gas, and would also instal an electric plant at the gas-works for lighting the town, to be sold to the Corporation, less an agreed depreciation, at the end of the lease of the gas-works. It was decided to interview Mr. Sargent, and at the same time to keep in touch with the North Wales electric lighting scheme.

Cable Box Explosion at Battersea.—Several people received injuries on Saturday morning through an explosion in connection with an electric cable inspection box at the corner of Totteridge Road and York Road, Battersea. The heavy iron and concrete manhole cover was blown up and broken. One portion, flying into small pieces, smashed many windows and caused the personal injuries. The electric service was dislocated for some time.

Owing to the failure of the electricity supply, Ardee (co. Louth) had to do without this form of lighting for a week.

The Ashbourne (Derbyshire) District Council have approved a recommendation of the Gas Committee that the discount be increased to 5d. per 1000 c.ft., from the 2d. at present allowed.

The Directors of the Continental Union Gas Company, Ltd., announce that a dividend of 4 p.ct., less tax, will be payable on Jan. 2 next on the 7 p.ct. preference stock, for the year ended June 30 last, being an increase of 1 p.ct. on that paid for the year ended June 30, 1921.

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